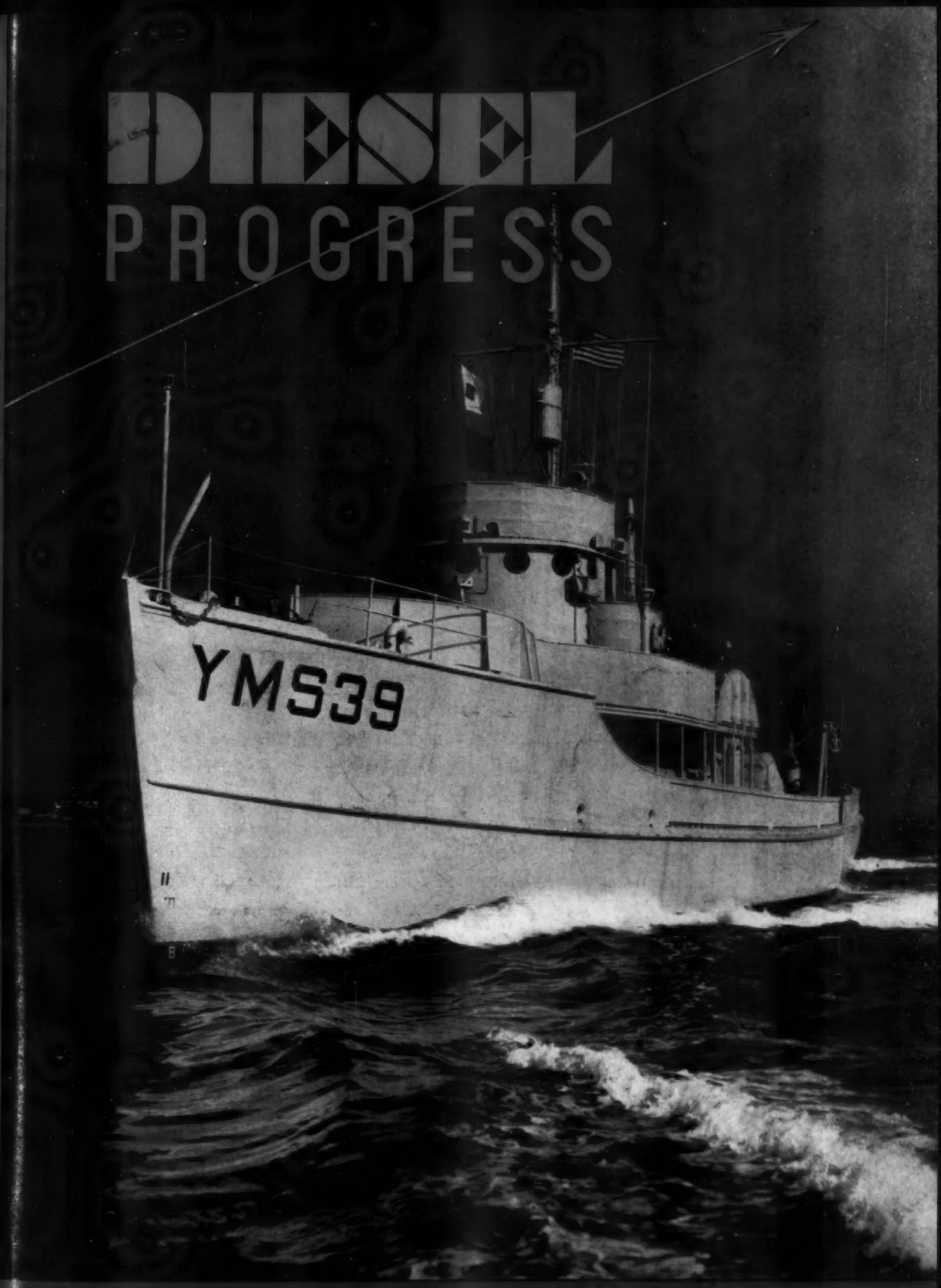
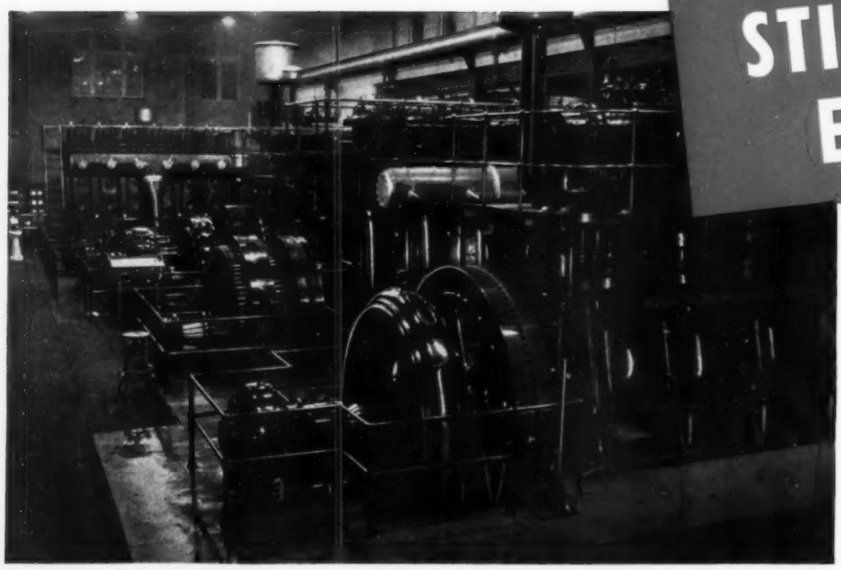
DIESEL PROGRESS



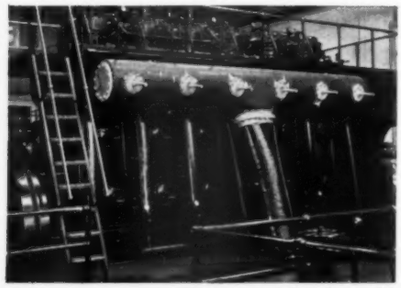
JUNE, 1942

After 26 Years

STILL HIGHLY EFFICIENT



7 DIESELS delivering 4510 hp. in one of the oldest and largest Diesel power plants in the Mid-West. All lubricated with *TEXACO URSA OILS.*



Comparative operating tests of other oils have confirmed to the management at Sioux Falls the wisdom of their use of Texaco.

THEY PREFER TEXACO

★ More locomotives and cars in the U. S. are lubricated with Texaco than with any other brand.

★ More revenue airline miles in the U. S. are flown with Texaco than with any other brand.

★ More buses, more bus lines and more bus-miles are lubricated with Texaco than with any other brand.

★ More stationary Diesel horsepower in the U. S. is lubricated with Texaco than with any other brand.

★ More Diesel horsepower on streamlined trains in the U. S. is lubricated with Texaco than with all other brands combined.

FOR YOUR ENJOYMENT
FRED ALLEN every Sunday night. See your local newspaper for time and station.

Care for your Car ..for your Country

IN this Sioux Falls, S. D., power plant, 7 Diesels totaling 4510 hp. are operating with free rings, delivering full power.

The first engine, installed in 1916, and all the other units were started up and are still operating on *Texaco Ursa Oil.*

Chief Engineer A. T. Hanson freely credits *Texaco Ursa* for keeping "bearing and liner wear very small"... for maintaining a profitable plant operating record.

Because of similar benefits secured by users everywhere—

More stationary Diesel horsepower in the U. S. is lubricated with Texaco than with any other brand.

The outstanding performance that has made Texaco FIRST in the stationary Diesel field has made it FIRST in the fields listed in the panel.

These Texaco users enjoy many benefits that can also be yours. A Texaco Lubrication Engineer will gladly cooperate... just phone the nearest of more than 2300 Texaco distribution points in the 48 States, or write: The Texas Company, 135 East 42nd St., New York, N. Y.

TEXACO Lubricants and Fuels
FOR ALL DIESEL ENGINES

HELP WIN THE WAR BY RETURNING EMPTY DRUMS PROMPTLY

DIESEL PROGRESS for June, 1942. Volume VIII, Number 6. DIESEL PROGRESS is published monthly by Diesel Engines, Inc., 2 West Forty-fifth Street, New York, N. Y. Rex W. Wadman, President. Acceptance under the Act of June 5, 1934, at East Stroudsburg, Pa., authorized March 27, 1940. Subscription rates: $5.00 per year, single copy, 50c

DIESEL and GAS ENGINE PROGRESS

REX W. WADMAN
Editor and Publisher

FRONT COVER ILLUSTRATION: One of the sturdy Diesel propelled mine sweepers now in active war service. —Official U. S. Navy Photograph

TABLE OF CONTENTS ILLUSTRATION: A Caterpillar Diesel tractor pulling a John Deere, 12 ft. cut combine, harvesting oats near Ojai, California. This tractor, working ten hours daily, covers thirty acres a day. Fuel consumption every eight hours is five gallons of 5¼¢ fuel.

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HEYWORTH CAMPBELL
Art Director

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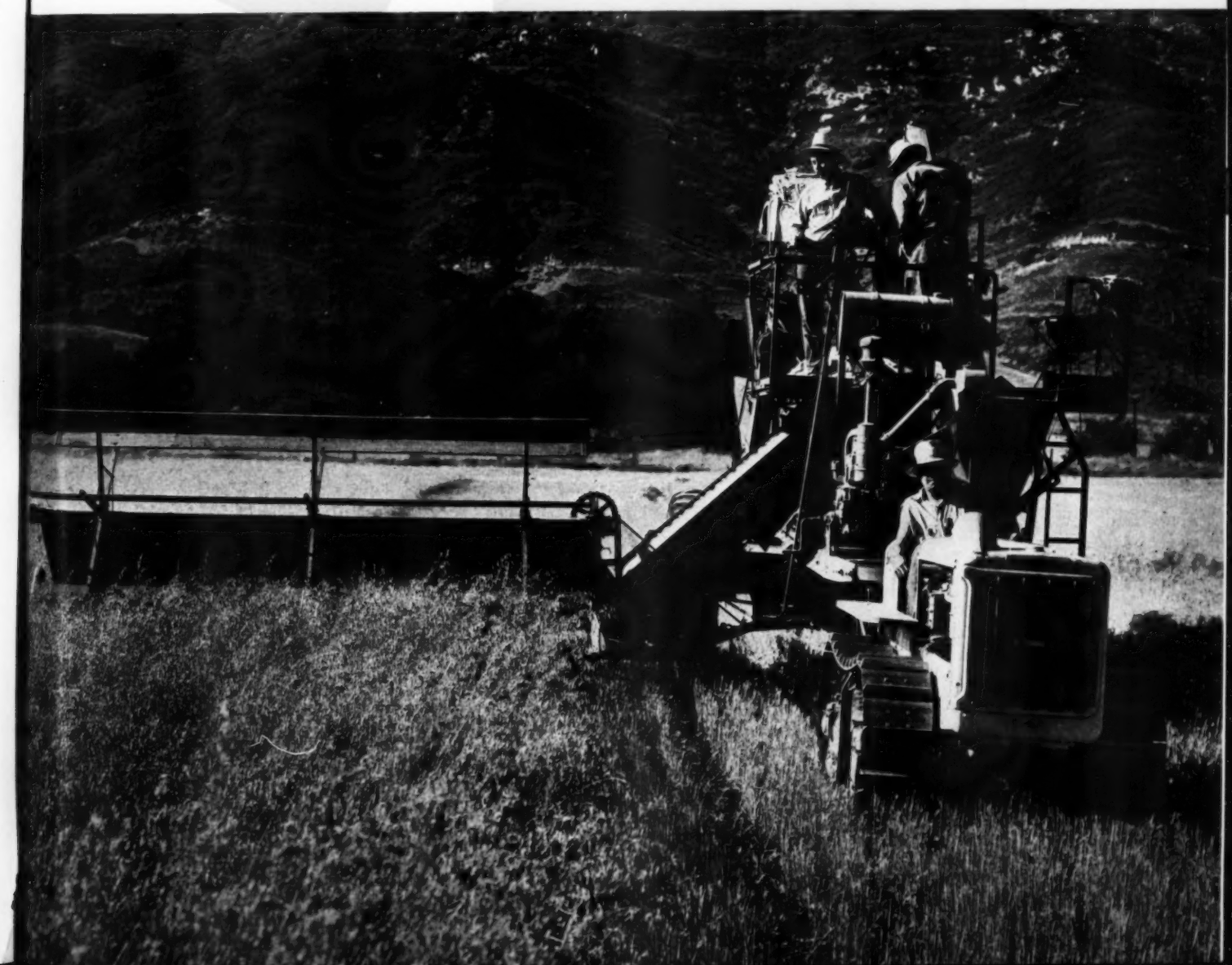


THE "UPHILL & DOWNHILL" IS SAVED BY DIESELS

By CHAS. F. A. MANN

EDITOR'S NOTE: This story describes the resurrection of a little electric railroad system slated for the junkpile in 1941, but saved and made profitable by substituting but three Diesel locomotives for a fleet of thirteen electrics! The characteristic thoroughness of the "Empire Builder's" Railroad illustrates a unique lesson that may save the life of dozens of smaller shortline railroads and disused electric interurban lines, now rusting in idleness.

LAST year a pain in the neck to Great Northern Railway Directors—this year a miniature Success story of railroading!

The Spokane, Coeur d'Alene, and Palouse, the funny little "Uphill and Downhill" railroad operating out of Spokane, has a real story to tell that bridges the gap from 1925 to 1942 in the life of a typical American interurban railroad line that almost folded for the usual trouble of not having enough to do to justify keeping it running.

Fifteen years ago! That was two years before the so-called smash of 1929, and it marked the practical end of the greatest array of funny short-line railroads and interurban electric lines the world has ever seen. Thousands of miles of light track, spinning a railroad web around practically every city in the United States, all more or less the brainchild of a Power Company President who saw in them a means to sell more electricity from the Parent to the Railroad stepchild, were galloping and jolting their last days as carriers of passengers, newspapers, produce, merchandise freight, and Sunday trippers to nearby resorts or out of the city a few miles to a placid farm.

In 1927, even Junior, in High School, was demanding a fancy double-horned Jalopy to go to school each morning. Where the modern super highways reached out, parallel to the electric lines, it was but a matter of a few months till the interurbans folded up. Here and there, around the United States, were powerful, large electric systems that found out they could haul freight and act, under the State and Federal laws, as switching railroads. These managed to survive by the skin of their teeth, but largely because some powerful steam railroad system played wet nurse at their annual deficit parties when the year's accounting was made.

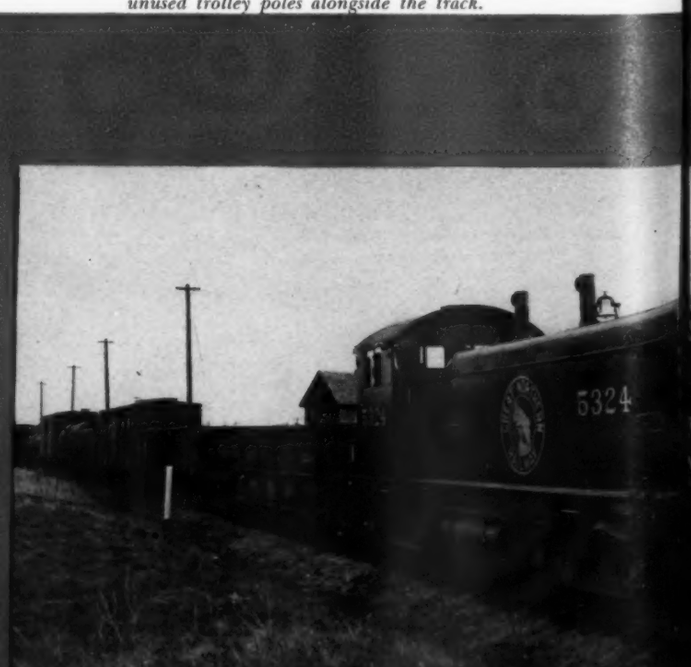
Yes, America, then without the modern, ultra-husky, very economical Diesel locomotive, as we know it today, faced sadly the loss of hundreds of million dollars worth of assets and one of the institutions that helped make transportation history on this continent.

One by one, the electric interurbans folded up, as baffled owners and managers could see no freight haul on their crooked meandering lines made up of light rail, light power, and about-face curves that limited speed and cut down the weight, size tractive effort, and speed of locomotives,—all of which, in turn, made them simply "Mickey Mousers" that could run a magnificent freight train of ten or fifteen cars and a full crew of four or five with 100% loss of operating profit each trip made. On the Pacific Coast there are a half dozen surviving lines of this type on the whole vast 1,500 mile strip from Canada to Mexico. The rest have "Gone With The Wind".

NOT A SINGLE SYSTEM IS INDEPENDENT—all are mostly unprofitable lines spoonfed by powerful railroads who keep these little rascals alive as switching lines in congested industrial zones, or, since the War, have found new-born freight tonnage to scoot over their rusting trackage. Perhaps the most interesting example of that famed "Fate Worse Than Death" of an electric interurban system is to be found under the indifferent, "Show-Me-Joe" wing of the Great Northern Railway system. We say "indifferent", for if the brilliant scheme just carried out by that famous company is not successful on its merits alone, no further senti-

The 600 hp. General Motors Diesel locomotive on the SCAP line of the Great Northern. This unit works eight hours switch duty in Spokane Yards and sixteen hours on line haul duty on SCAP line.

The 1,000 hp. General Electric Diesel locomotive hauling a nine-car freight train on the Spokane, Coeur d'Alene & Palouse R. R., subsidiary of the Great Northern. Notice unused trolley poles alongside the track.



mental outlay of cash and patience will be made on the line, and it, too, will go the way of the others.

Out of Spokane, to the South, is a rolling, rich wheat country, stretching away to the Oregon country and slightly east into Idaho, along the Western edge of its long north Panhandle. This is the famous Palouse wheat country of the Pacific Northwest, where once forty-horse teams and steam tractors dragged huge combines over the wheat fields, and later opened the most mechanized branch of farming to the very original Caterpillar type tractors and the first Diesel Tractors.

Meandering pleasantly, uphill and down, was the Spokane Coeur d'Alene and Palouse railroad, a nifty little electric line composed of the old Spokane-Coeur d'Alene interurban electric line—a glorified streetcar system running to the edge of that vast inland lake just across

This map was drawn by the master mechanic of the Great Northern at Spokane, to better illustrate the territory covered in this article.

The 360 hp. General Electric locomotive powered with Caterpillar Diesels, smallest of the fleet of three Diesel locomotives used on the SCAP line. This particular unit serves the Coeur d'Alene branch.

the Idaho boundary, and a longer line running South to Colfax, Washington, in the middle of the wheat belt, and a branch running Southeast to Garfield and Moscow, Idaho, bustling college and farming town and home of Doc Robinson's "I Talked With God", spectacular mail-order religious thing that makes Moscow's postoffice almost as important as Jersey City and Newark combined!

The Great Northern has, for years, operated these lines to bring out wheat, hay, peas, and lumber from the fields and the pine sawmills

A complete seventeen-car freight train going up the 2% grade on the SCAP line en route to Moscow, Idaho. The locomotive is a 1,000 hp. General Motors Diesel unit which pulls 670 tons up this hill and 870 tons beyond. Note old trolley poles now displaced by the Diesel locomotives.

on Lake Coeur d'Alene, and do switching in a congested 17-mile area in the Spokane industrial district. The Spokane-Moscow Line is ninety miles long; the branch from Spring Valley to Colfax is 37 miles long, both having been operated with a 6,600 volt alternating current system. The Spokane-Coeur d'Alene line, extending 35 miles due East of Spokane, was a conventional street-car type operation, using 600 volts direct current, and conventional control system.

With three or four huge electric generating stations along the Spokane river, right in the heart of the city of Spokane, the complete assumption was for years that the so-called "cheap" electricity was the only kind of power to use. This illusion went on until about a year ago, when Great Northern Officials began studying their almost useless "SCAP" line, they began to realize that the price of electricity at the switchboard is one thing, but the cost of a drawbar horsepower out on the outer end of a trolley line is a "horse of a different color." Most of the profits (Operating) of this system came from the terminal switching operations, with just about enough revenue off the rest of the System to pay expenses, but no return. Because of the light-weight rail, curvature, lack of water stations and other factors, use of steam power was out of the question. In order to provide short wheelbase power—not to exceed the length of a boxcar, the obvious thing was to turn to Diesel locomotives, PROVIDED the changeover costs were not too high.

The Coeur d'Alene line was 600 volts d.c., had two 360 hp. electric locomotives and two 500 hp. electric locomotives, of the conventional streetcar type with two 4-wheel trucks with a small d.c. traction motor geared to each of the four axles. The Moscow line boasted of a regular little fleet of electrics, and had four units with four 100 hp. geared traction motors and five units with four 150 hp. geared traction motors. This line, like the rest of the system, received electric power at 45,000 volts and stepped it down to 6,600 volts a.c. for the trolley, and on each locomotive unit a transformer, connected with the controller in the engineer's cab, delivered current to two of the traction motors (a complete truck) in series, so as to bring down the operating voltage to around 600 volts maximum on each of the motors. This was the pioneer type of single phase alternating current system now used on the Pennsylvania Railroad. Each unit carries its own stepdown transformer. The locomotive units on this end of the line were always used in two units to form a single-operated power plant. The 700 series units would handle 600 tons trailing load over the line, while the 600 series would handle 450 tons for the smaller size and 700 tons for the d.c. locomotives.

Thus, the famous SCAP Railroad had two complete electrifications within a single 165 mile system, and everywhere went the complicated overhead trolley, with its costly pole line and transformers.

But comes along Pearl Harbor, with subsequent copper shortages, Priorities and all the rest. The same astute Engineering Staff that has made the Great Northern world-famed for its low-level Marias Pass crossing of the Rockies; its 125 car freight trains behind a single engine; its eight mile Cascade Tunnel, and many other daring innovations, beat Pearl Harbor to the draw, by FOUR MONTHS, and last Summer sold the precious Power line franchises, copper wire, transformers and switching gear, lock, stock and barrel, to the Washington Water-power Company of Spokane for $140,000 CASH! Then it put up its locomotives for sale to a Seattle Junk yard, and decided to go whole hog for Diesel locomotion.

With enough cash realized from the sale of copper wire to pay for two or three small Diesel locomotives, the next step was to figure a way to REPLACE THIRTEEN ELECTRIC LOCOMOTIVES WITH BUT TWO OR THREE LIGHT DIESELS!

The Moscow Line has a maximum, or ruling grade of 2%, and the Colfax Line also 2%, while the Coeur d'Alene line has but 1%. Thus, if the Diesels were light enough, the grades were safely within range of switch engine types of power FOR MAIN LINE HAUL. Some industrial spurs have grades as stiff as 3% for very short distances, but, in the main, you take a neat little twenty-car freight train, mostly loaded with golden Palouse Country wheat, totalling 1,200 tons gross (a small, 1903 size freight train) and chug uphill at slow pace, and then let her roll downhill and halfway up the next rise! It was finally calculated that the very LARGEST Diesel needed for the service would be a 1,000 hp. model with a load limit of about 31 tons per axle.

On the Coeur d'Alene line, a Diesel locomotive of less than 400 hp. could do the trick nicely, for average loads, and spend the rest of the twenty-four hour shift shunting cars in the Spokane yards.

An in-between size, of 600 hp. would handle extra heavy trains out to Coeur d'Alene and could also be used for the Colfax run as a branchline helper during heavy movement of grain.

Having literally invented the sound policy of running only maximum loaded freight trains

at all times, this idea of a twelve or eighteen car daily freight train into the wheat belt, loaded each day, would serve its purpose and give high operating efficiency without a large, clumsy investment. In plainer words, work a smaller Diesel the clock around, rather than underwork half time a larger unit. Beside, the Public wants FREQUENT service now, as well as FASTER service.

The power of the SCAP line now consists of 360 hp. Caterpillar Diesel locomotives, with two 180 hp. Caterpillar 4 cycle Diesels. This works an eight hour shift, switching in the Spokane yards, and makes a daily round trip out to Coeur d'Alene.

Next in size is a 600 hp. Model 567, 6 cylinder locomotive, that runs seven days per week, sixteen hours on the SCAP line and eight hours switching on the G.N. in Spokane yards, with four hours per WEEK—just think of it—out for inspection, usually of a Sunday morning.

The biggest in the fleet is the 1,000 hp. General Motors, 12 cylinder job that runs six days per week, making the Spokane-Moscow trip every day but Sunday, and three times per week the trip down to Colfax and back, from Spring Valley Junction.

The smaller of the three locomotives weighs 89,112 lbs.; the 600 hp. weighs 199,200 lbs., and the 1,000 hp. job 249,300 lbs., each ready for the road.

In the old days the electrics went down one day and back the next, and the short line had a round trip per day. The Diesel fleet of three gives daily service everywhere, with a couple of switching shifts in the G.N. yard thrown in. Out of Spokane for twelve miles the SCAP climbs a 2% grade—practically a mountain gradient. The 1,000 hp. General Motors will carry 670 tons out of Spokane to the top of the hill and 870 tons the rest of the way, without trouble. A dozen nicely loaded cars and a caboose buzzing over the wheatfields on a system slated for the junkpile in 1941!

But the replacement with Diesel does not tell all the story. The electrified system had eight substations on the line, unattended, and there were some 18,000 poles to be maintained. It took a crew of thirteen men in the electric distribution system to keep things going, and take care of pole and wire repairs.

The electric locomotive shop in Spokane was converted into a badly needed special shop for taking care of Company Equipment, such as scrapers, snowplows, bulldozers, etc., and the electric shop repair crew of sixteen were kept right on the payroll, looking after all the Diesels operating out of Spokane, as well as part time work in season on special company equipment, thus relieving the busy Hillyard general shops, crowded with Wartime repair work.

The purchased electricity was received at 60,000 volts, 3 phase, 60 cycles, billed through the meter at 6/10 of one cent per kilowatt. At the time this rate was given, many years ago, it was an unheard of low rate for this kind of service. But, THE COST OF GENERATED ELECTRICITY BY A DIESEL ENGINE PRODUCING 10.1 KILOWATTS PER GALLON OF FUEL CONSUMED, SAID FUEL COSTING ABOUT FOUR CENTS PER GALLON, REVEALS SOME NEW PHASES OF DIESEL ECONOMY HERETOFORE NOT CONSIDERED SERIOUSLY. Later on we shall vividly chart how this cost really works out.

First of all, keep in mind that the Diesel-generated electricity is RIGHT ON THE LOCOMOTIVE, ready to use. Purchased current at 6/10 of one cent MAY BE 90 MILES AWAY AND SUFFER A 25% LINE LOSS BEFORE IT GETS TO THE LOCOMOTIVE.

Actually, SCAP LINE RECORDS SHOW THAT PURCHASED ELECTRICITY AT THE MOTORMAN'S CONTROL LEVER COSTS ABOUT 8/10 of a cent, while the combined cost of fuel, lube oil, maintenance, etc., brings the cost of Diesel generated electricity to around 6/10 of a cent per kwh., OR ONE-THIRD CHEAPER THAN HYDROELECTRIC POWER.

And, you scrutinizing statisticians remember that this purchased cost per kwh. of hydro-electric power does NOT figure the original cost, interest, repairs, amortization, etc., of the copper wire, poles, etc., or transformer cost of that same 6/10 cent electricity. ACTUALLY ELECTRIC POWER AT THE CONTROLLER HAS COST THE SCAP LINE NEARER 1.2c PER KILOWATT HOUR, OR TWICE THE BILLED COST TO IT, FROM THE POWER COMPANY.

So, with even a so-so Diesel locomotive performance record, the fussy Great Northern Directors should be happy over the following statistics on kwh. costs.

Table 1.

For February, 1942, the following availabilities:

360 hp. Caterpillar	100 % availability
600 hp. General Motors	98.8% availability
1,000 hp. General Motors	100 % availability

(The highest average on the whole G.N. system)

Table 2.

Performance Record of Locomotive 5324 (1,000 hp. General Motors) January, 1942

Hours Worked—528
Hours out of Service—NONE
% Available—100%
Gross Ton Miles—2,366,953
Total kwh. Generated—117,700
Total fuel Used—10,670 gallons
Gallons Fuel Per Hour—20.20
Fuel, in Gals., Per Hr., Per 1,000 Gross Ton Miles—4.50 (Standard Railroad Yardstick)
Total Gals. Fuel Per kwh.—.09
Total Lube Oil—155 gallons (Complete oil change)

NOTE: It takes 125 gallons for an oil change. This is done every 18,000 gallons of *fuel oil consumed*, regardless.

Pints of Lube Oil Per Hour—2.2*
*December, 1941—.343
*February, 1942—.487

Maintenance Expense—$657.30
(Wiping, Repairs, Servicing, Shop Expense & All Non-Opr. Expense chargeable to No. 5324—I.C.C. Accounting)

This locomotive made 27 round trips and went 6843 miles.

Refuelling is done at Spring Valley on the South line and in Spokane for the North line, at a single simple wayside station.

Table 3.

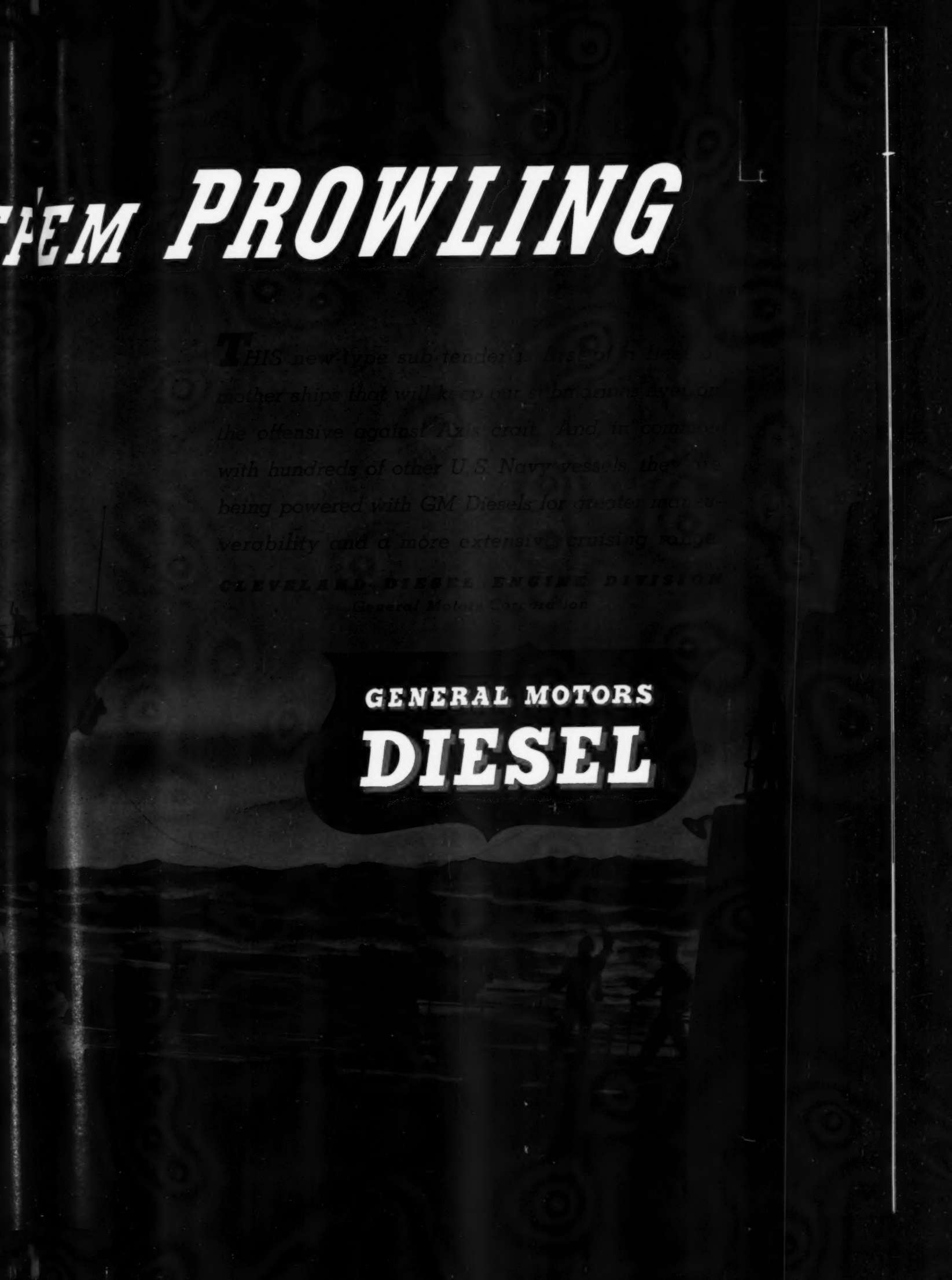
Test Run Summary, Round Trip Spokane to Palouse & Return
Test run, August 14, 1941

Total kwh.—3800
Total Fuel—379 gallons
Kwh. Per Gal.—10.1
Gal. Per kwh.—.098
Running time—8.4 hours
Load Factor—64%
Kwh. per Ton Mile—Net, .0385; Gross, .0325
Ton Miles Per kwh.—Net, 26.0; Gross 30.5
Fuel Oil Basis:
Ton Miles Per Gallon—Net, 260; Gross, 310
Gallons per 1000 Ton Miles—Net, 3.85; Gross 3.25

Probably no other railroad in the U.S.A. has given Diesels the gruelling, high load factor tests in freight runs that the Great Northern has in the past eighteen months. The G.N. has long boasted of the finest large fleet of steam power in the U.S.A., for the total mileage oper-

. . . *And now please turn to page 62* . . .


TO KEEP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THIS new-type sub tender is built to be
mother ships that will keep our submarines
the offensive against Axis craft. And in com
with hundreds of other U. S. Navy vessels, the
being powered with GM Diesels for greater
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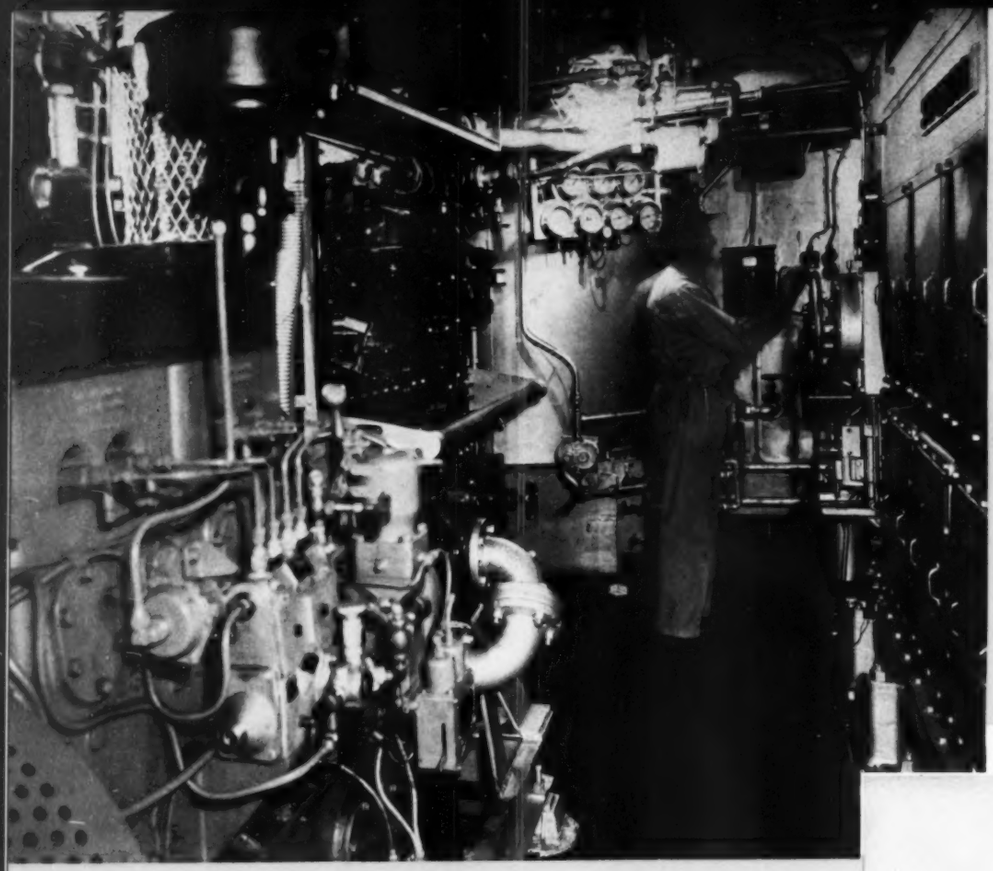


Engine room looking forward along the port side of main Diesel, an 8 cylinder, Superior, 900 hp., 360 rpm. engine. One of the auxiliary units is seen left foreground.

Engine room view showing both auxiliary units and full length of main Diesel.

One of the two sister tugs, "Lt. Col. John H. Adams" and "Maj. Halbert H. Noyes," on trial run.

BIGGER AND BETTER ARMY TUGS

By WARREN GLEASON

TWO new 102 ft. tugs were recently completed for the U. S. Army Quartermaster Corps by the Shipbuilding Division of Equitable Equipment Co., Inc., of New Orleans, at the firm's Madisonville, La., shipyard.

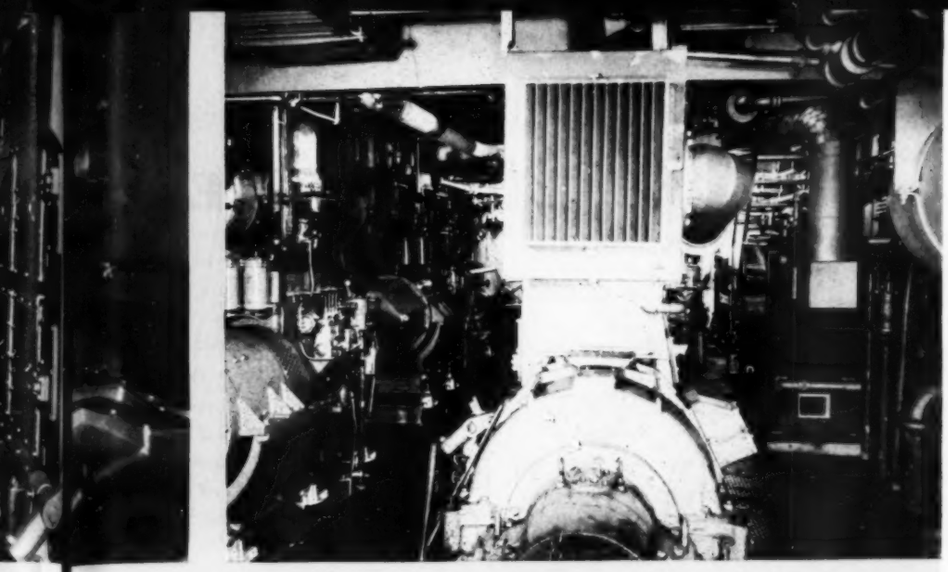
According to the naval architects for the company, "These 102 ft. tugs have everything you would expect to find in a tug of 125 ft. overall length."

Equitable Equipment Co., Inc., has delivered many outstanding tugs and barges to the Quartermaster Corps, U. S. Army. During the past twelve months, five 82 footers, each powered with a 560 hp. Superior Diesel, came down the ways and were accepted for the service. The new vessels, *Lt. Col. John H. Adams,* just delivered, and the *Maj. Halbert H. Noyes,* soon to be commissioned, are far superior to the previous tugs in size, power, and ability.

Overall dimensions are 102 ft. length and 25 ft. beam; the depth of hold has also been increased over the previous models. And while the general outline and appearance of the new craft bears great resemblance to the 82 ft. models, the great increase in length accompanied by the only slight increase in beam has effected a marked change in the character of the boats. There is an effect of smooth, seaworthy trimness and easy ability.

Ample power, however, matches the beautifully proportioned hulls. Instead of the 560 hp. Superior Diesels driving the former models, the new 102 footers are powered with the air-starting, direct reversible Superior Diesels of 8 cylinders, 14½ in. by 20 in., developing 900 hp. at 360 rpm. with a BMEP of 75.8 lbs., or 960 hp. at 360 rpm. @ 80 lbs. BMEP; both ratings being for continuous duty.

Full force feed lubrication to all moving parts is built into these Diesels; pistons are oil-cooled.



In this view are seen the Korfund Vibro Isolators under each of the auxiliary units, left, which effectively isolate operating frequency and noise from other parts of the vessel.

Circulating pumps for raw and fresh water are also built-in.

Protection has been included for every conceivable contingency. Moisture in the starting and maneuvering air is eradicated by the incorporation of a Dri-Air filter. The Alnor pyrometer, directly in front of the engineer's eye, gives instant readings of the working temperatures of all cylinders. Weston electric tachometers are installed for engine rpm. indication. An Elliott twin-strainer is installed below the waterline for filtering all water taken into the ship's raw water circulating system.

Lube oil is protected and reclaimed by a Nugent pressure filter. For additional security to the lubricating system, a complete set of lube oil pumps, driven by electric motors, is installed to supplement the built-in lube pumps. Should the latter fail for any reason, push-button control instantly throws the battery of auxiliary pumps into action.

Auxiliary power is also full-Diesel. On each new tug is a pair of Superior Diesels, each engine direct-connected to a 30 kw. Crocker-Wheeler generator. The auxiliaries, however, each rest upon Korfund Vibro-Isolators. Vibration from auxiliary engines, so noticeable on many boats, is absent on these new Quartermaster tugs.

Direct connected to the forward end of one auxiliary Diesel is a Waterous fire and bilge pump, delivering 280 gpm. at 100 lb. pressure.

Other engine-room machinery is driven by electric motors.

Such equipment includes, on each boat, a Viking Model ZLQ bilge pump, powered by a 3 hp. Crocker-Wheeler motor; a Goulds automatic unit for sanitary and fresh water, driven by a 1/6 hp. General Electric motor; a Goulds fuel transfer pump with a 1½ hp. Crocker-Wheeler motor; a Goulds emergency fresh-water pump driven by a 5 hp. motor.

Two Worthington compressors equip each boat, and 10 hp. Crocker-Wheeler motors turn them; one compressor is full automatic in operation, the other being arranged with push-button starting and manual unloading.

Cooling of all three Diesels on each tug is closed circuit by individual Ross heat exchangers. Penflex tubing is used for carrying all exhausts to Maxim silencers of the spark-arrester type.

Hot pipe insulation in the engine-room is accomplished by wrappings of Fiberglas, an Owens-Corning product. According to the builders, savings in installation costs in both time and money is practicable by use of this material, due to its ease of application by ordinary workmen.

Crane supplied the special steel main injection valves, as well as the automatic oil-burning heater supplying hot water to the heating radiators; Walworth "Walseal" Silbraze valves, fittings and flanges are installed, providing vibration and shock-proof joints.

Batteries for the electrical system are 56-cell Exide Ironclad Marine, 200 a.h. discharge rate; switchboards are Ward-Leonard.

Quarters are provided for a crew of not more than twenty-five.

Steering of the tugs is accomplished by the Smola electric system; three sets of controls are located in the pilot-house, one at the steering wheel and one at each side, the latter positions affording the helmsman great ease of maneuvering the tug into close quarters; full vision, front and rear, is afforded at these side steering positions. A set of engine-room control signals is installed at each steering position.

At the trials of *Lt. Col. John H. Adams,* ease of motion was noted as well as a free-running speed exceeding that of most seagoing tugs.

These 102 footers will have no difficulty in going places; unusually large tank capacity for both fuel and water provides a wide cruising radius. Needless to say, BMIN and ABS approval has been forthcoming for full ocean towing service. Construction of the tugs was under the supervision of Col. W. W. Moore, Chief of Marine Department, U. S. Quartermaster Corps.

Other ship's equipment aboard these vessels includes WebbperfectioN carburetor-type oil-burning galley ranges; McCray electric refrigeration; American Radiator and Standard Sanitary toilets and lavatories; Kearfott windows in the pilot-house; Oceanic lighting fixtures; Columbian Model MI three-blade propeller; Goodrich Cutless bearings; Lane lifeboats; AECO gypsey with 7½ hp. Diehl motor; Baldt anchors; Bethlehem wire rope rigging; Chase Brass and Copper Co., Inc., copper tubing; Crane water-pressure gauges; Bendix telltales for mast and running lights; Kelvin White compasses; Lux fire-protection; Kirk-Habicht engine-room controls.

A series of 105 ft. tugs, to be Superior Diesel powered, is on the docket of the Equitable Equipment Company's Shipbuilding Division, also for the Quartermaster Corps. The Army is very particular about the boats for its own private navy, and this live New Orleans firm is repeatedly proving that it is amply able to do a fine job in building them.

BEARINGS FOR DIESEL ENGINES*

By ALBERT B. WILLI†

THE scope of this paper will be generally confined to bearings and bearing materials used for main and connecting rod bearings in Diesel engines.

It is fundamental that there is no universal bearing material good for any and all installations. Each available material has its own field of usefulness, and it must be used within the limitations of that field if optimum bearing performance is to be obtained.

When metals are freely available, five types of lining materials are used in Diesel engine bearings; viz, Tin base babbitt of several compositions in combination with back structures of steel, bronze, and cast iron; Lead base babbitt of several compositions in combination with back structures of steel, bronze, and cast iron; Cadmium-Silver-Copper bearing alloy in combination with steel backs only; Copper-Lead mixtures in combination with steel backs only. The field of usefulness of these various bearing metals is defined in Table 1.

Connecting rod bearings usually show distress before the main bearings are affected. It is interesting to compare the design elements and mathematics of certain Diesel engine rod bearings, to match these things against the established ratings and then consider their record of performance in the field. This comparison is made in Tables 5 and 6. The picture is very clear that bearing metals applied within their defined field of usefulness will show or can be made to show satisfactory performance while questionable and unsatisfactory performance will follow unsuitable material selections.

It is a fact that the performance of an engine bearing may be unsatisfactory even though all of the "safety factors" are within the values herein defined. This will be due to faults in associated elements such as oil pressure, oil volume, oil distribution, oil viscosity, shaft or housing deflection, oil grooving, out-of-round saddle bores, etc. If the safety factors are within the values shown, however, it is a reasonably good guaranty that a successful installation can be obtained. Conversely, if the bearing factors are beyond the values shown it is just as good a guarantee that a successful installation will be *most* difficult to obtain.

At this time, it is no longer possible to select always the most suitable bearings for a give engine. The use of tin and cadmium is se ously restricted which requires that the use domestic metals such as lead and copper mu be extended and even these are not availabl in unrestricted quantities.

The most likely substitute for tin base babbi is lead base. If some of the existing literatu on the subject of lead base babbitts is tak too literally, the prospects are not so brigh For example, one authority says, "Tin ba metals are used where pressures are relative high and temperatures may be considera above atmospheric. Lead base metals are us where the pressures are lower and temperatu not so high".

Actually, the situation with respect to the su stitution of lead base babbitt for tin base Diesel or gasoline engine bearings is not at gloomy at this moment. It is not possible say that *any* lead base babbitt can replace a tin base babbitt under *any* and *all* condition but it is possible to specify *certain* lead ba babbitts applied under defined condition which will replace *certain* tin base babbitts an obtain *improved* performance. There has be a definite trend in this direction for sever years and many automotive gasoline and Die engines have been regularly produced wi lead base babbitt main, connecting rod an camshaft bearings. The reason for this tren has been improved performance.

As an alternate for Cadmium-Silver-Copper

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* *Excerpts from a paper prepared for A.S.M.E. Oil and Gas Power Meeting at Peoria, Illinois, June, 1942.*
† *Chief Engineer, Federal-Mogul Corporation.*

TAB. 1. CHART SHOWING FIELD OF USEFULNESS FOR VARIOUS BEARING METALS

DESCRIPTION OF BEARING METAL	MAXIMUM PERMISSIBLE UNIT PRESSURE	MINIMUM PERMISSIBLE Zn/Pmax	MAXIMUM Pmax V	OIL RESERVOIR TEMP.	MINIMUM CRANKSHAFT HARDNESS	AFFECTED BY CORROSION
TIN BASE BABBITT COPPER 3.50% ANTIMONY 7.50% TIN 89.00% LEAD (max) 0.25%	1000 p.s.i.	20	35000	235° F	NOT IMPORTANT	NO
* STANDARD QUALITY BEARINGS						
TIN BASE BABBITT SAME COMPOSITION AS ABOVE	1500 p.s.i.	15	42500	235° F	NOT IMPORTANT	NO
† ALPHA PROCESS QUALITY BEARINGS						
HIGH LEAD BABBITT TIN 5 to 7% ANTIMONY 9 to 11% LEAD 82 to 86% COPPER (max) 0.25%	1800 p.s.i.	10	40000	225° F	NOT IMPORTANT	NO
CADMIUM-SILVER SILVER 0.75% COPPER 0.50% CADMIUM 98.75%	OVER 1800 AND UP TO 3850 p.s.i.	3.75	90000 AND UPWARDS	260° F	250 BRINELL	Not likely if temperature is maintained as specified and proper lubricating oil is used
COPPER-LEAD COPPER 65% LEAD 35%	OVER 1800 AND UP TO 4500 p.s.i.	3.75	90000 AND UPWARDS	260° F	300 BRINELL	

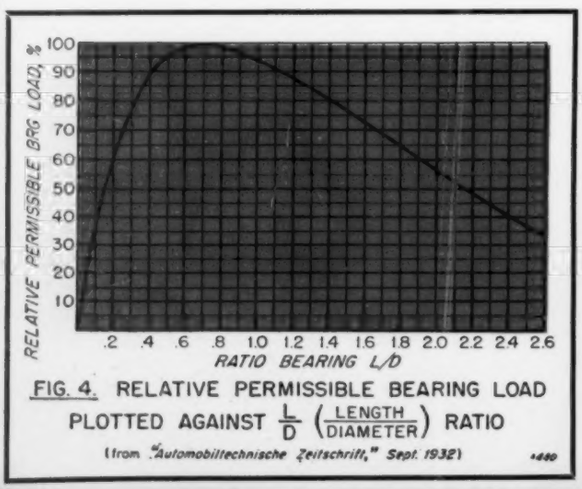


FIG. 4. RELATIVE PERMISSIBLE BEARING LOAD PLOTTED AGAINST $\frac{L}{D}$ $\left(\frac{\text{LENGTH}}{\text{DIAMETER}}\right)$ RATIO

(from "Automobiltechnische Zeitschrift," Sept. 1932)

TABLE 5. DESIGN ELEMENTS OF CONNECTING ROD BEARINGS

ENGINE CLASSIFICATION — LARGE SIZE, SLOW SPEED

ENGINE	BEARING MATERIAL	MAX. LOAD P.S.I. AND R.P.M.	Zn/Pmax	PmaxV	OIL RESERVOIR TEMP. °F.	CR. SHAFT HARDNESS (BRINELL)	BRG. LINING THICKNESS	SHAFT DIA. AND OIL CLEARANCE	PERFORMANCE RECORD
16 - 6 CYL.	LEAD BAB.	2450 @ 350	3.14	37,200	180°	UNDER 229	.025	10 - .012	QUESTIONABLE
10 - 8 "	"	2163 @ 400	3.33	23,500	130°	"	.125	6½ - .004	"
8 - 6 "	TIN BAB.	2382 @ 825	4.16	31,000	140°	"	.032	4½ - .001	"
9½ - 8 "	LEAD BAB.	2242 @ 350	1.89	21,400	180°	165	.025	6½ - .004	"
12½ - 6 "	TIN BAB.	2150 @ 350	1.33	27,000	180°	165	.025	8½ - .005	"
* 12 - 6 "	LEAD BAB.	850 @ 327	8.47	12,100	120°	UNDER 225	.025	10 - .012	OK
10½ - 6 "	TIN BAB.	1105 @ 750	10.83	27,100	160°	"	.057	7½ - .004	"
8½ - 6 "	LEAD BAB.	1460 @ 500	5.85	36,330	160°	262	.037	6½ - .004	"
* 14½ - 8 "	TIN BAB.	968 @ 300	4.04	10,997	130°	207	.060	8½ - .004	"
* 12¾ - 6 "	"	870 @ 400	5.15	10,350	160°	UNDER 225	.078	6½ .003	"
10 - 6 "	LEAD BAB.	1983 @ 430	4.03	20,700	125°	"	.125	6 - .004	"

*GAS ENGINES

other cadmium alloy bearings, the selections will lie between a lead base babbitt and a Copper-Lead mixture and the choice is likely to be a compromise in which availability must take precedence over performance.

It does not seem reasonable to expect that substitutions can be made in wholesale fashion without catering to the conditions under which the substitute materials like to work. This can be illustrated by the behavior of a selected group of bearing materials under operating conditions. It is not possible to present a detailed picture which covers all of the ramifications and variables of material composition, lubrications, loads, speeds, etc., but it is possible to examine the behavior of certain selected bearing metals which have been successfully used in Diesel engine production.

In Fig. 7 is shown a comparison of four types of bearing metals with respect to coefficient of friction, lubricated and dry; shaft wear and bearing surface wear. The coefficient of friction (lubricated) values were obtained on a modified Herschel oiliness machine. The dry friction coefficients were taken using a slider with three highly polished ball contacts operating against a flat surface of the bearing metal mounted on an adjustable inclined plane. The angle of the plane was adjusted so that the slider would start from rest and move slowly and uniformly.

The shaft and bearing wear values are taken from a series of six cylinder engine tests. Shaft wear with the Cadmium-Silver-Copper bearings was high—.00032", and this is accounted for on the basis of low shaft hardness. A Brinell hardness of 250 is recommended for this material and the test shafts were 226 Brinell. Shaft wear with the Copper-Lead bearings was worse —.00061", and this is also accounted for on the basis of low shaft hardness. A Brinell hardness of 300 is recommended, while the test shafts were 246.

The lower shaft wear with the Bermax high lead bearings as compared with the "Genuine" tin base babbitt bearings can reasonably be attributed to the lower coefficient of lubricated friction. The differences in bearing wear do not match with coefficient of friction values and these differences are attributed to the individual characteristics of the metals. . . . .

EDITOR'S NOTE: Our readers' attention is again drawn to the fact that these two pages are but excerpts from the excellently prepared paper which Mr. Willi is reading at the Diesel Convention to be held at the Pere Marquette Hotel in Peoria June 17-19.

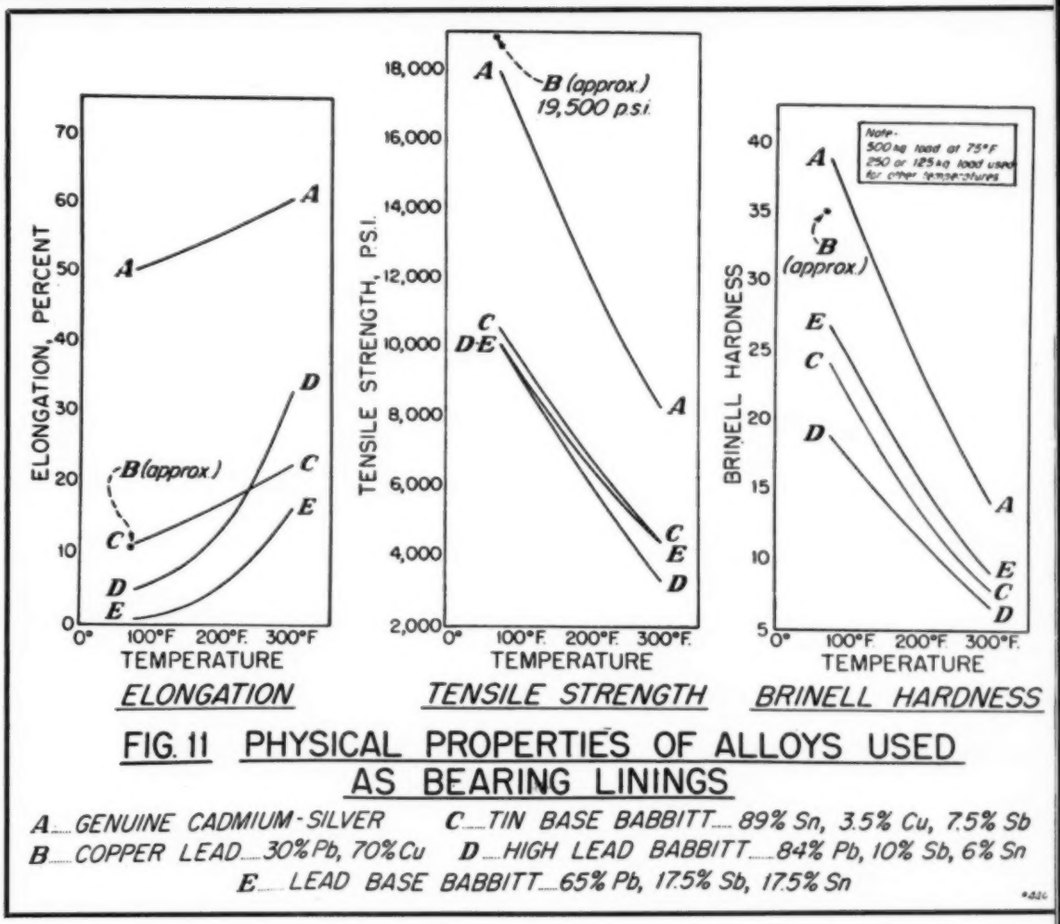


FIG. 11 PHYSICAL PROPERTIES OF ALLOYS USED AS BEARING LININGS

A—GENUINE CADMIUM-SILVER *C*—TIN BASE BABBITT—89% Sn, 3.5% Cu, 7.5% Sb
B—COPPER LEAD—30% Pb, 70% Cu *D*—HIGH LEAD BABBITT—84% Pb, 10% Sb, 6% Sn
E—LEAD BASE BABBITT—65% Pb, 17.5% Sb, 17.5% Sn

TABLE 6. DESIGN ELEMENTS OF CONNECTING ROD BEARINGS
ENGINE CLASSIFICATION.....SMALL AND MEDIUM SIZE

ENGINE	BEARING MATERIAL	LOAD P.S.I. AND R.P.M.	Pmax	PmaxV	OIL RESERVOIR TEMP. °F.	HARDNESS (BRINELL)	LINING THICKNESS	SHAFT DIA. AND OIL CLEARANCE	PERFORMANCE RECORD
5½-6 CYL.	LEAD BAB.	3250 @ 1800	2.90	63,985	180°	.175	.032	3⅜-.0025	QUESTIONABLE
6½-4 "	TIN BAB.	1665 @ 1200	5.92	24,000	180°	UNDER 225	.032	2½-.003	"
6½-4 "	"	1367 @ 600	2.22	13,410	225°	TOCCO	.030	3½-.003	"
6½-6 "	LEAD BAB.	2044 @ 1200	3.044	29,372	180°	240	.020	2⅝-.0025	"
5½-6 "	TIN BAB.	1875 @ 900	3.66	25,662	190°	269	.025	3⅜-.0035	QUESTIONABLE DUE TO CADMIUM SILVER
5½-6 "	COP. LEAD	2180 @ 1200	4.95	40,000	200°	484	.020	3½-.005	O.K.
5½-6 "	CAD. SIL.	2859 @ 1800	3.80	64,846	180°	269	.043	4½-.004	"
4½-6 "	"	2434 @ 1200	3.76	33,000	190°	269	.025	2½-.0016	"
6½-6 "	"	2392 @ 500	3.81		180°	321	.020	3½-.003	"
6½-4 "	"	634 @ 1000	3.95	20,208	200°	TOCCO	.020	2½-.0025	"
5-4 "	"	1765 @ 900	1.45		180°	285	.028	3½-.0025	"
5½-6 "	"	1909 @ 1200	2.71	29,300	240°	337	.025	2⅝-.002	"
4-6 "	"	2145 @ 1200	6.24	29,500	180°	TOCCO	.020	2½-.0025	"
6½-6 "	COP. LEAD	2655 @ 1000	1.76	32,000	230°	"	.016	2½-.003	"
5½-4 "	CAD. SIL.	2202 @ 1200	3.68	24,500	225°	248	.017	2½-.002	"
5½-6 "	"	2040 @ 1200	3.98	22,700	225°	248	.017	2½-.002	"
6½-6 "	"	2215 @ 1200	3.66	27,570	225°	248	.017	2½-.002	"
[illegible]	LEAD BAB.	1851 @ 850	2.37	28,683	180°	187	.028	4½-.0025	"

The coefficient of friction (lubricated) values were obtained on a modified Herschel oiliness machine. The dry friction coefficients were taken, using a slider with three highly polished ball contacts operating against a flat surface of the bearing metal mounted on an adjustable inclined plane. The angle of the plane was adjusted so that the slider would start from rest and move slowly and uniformly.

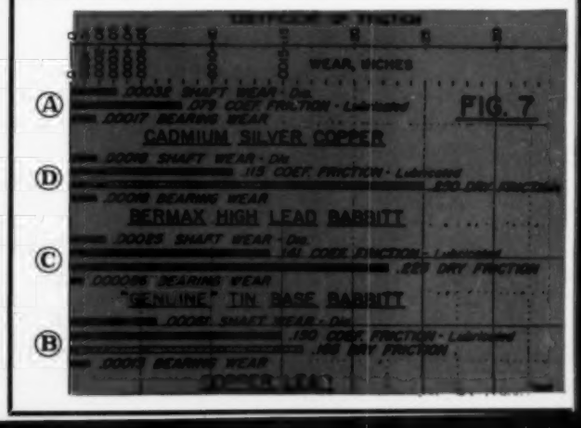


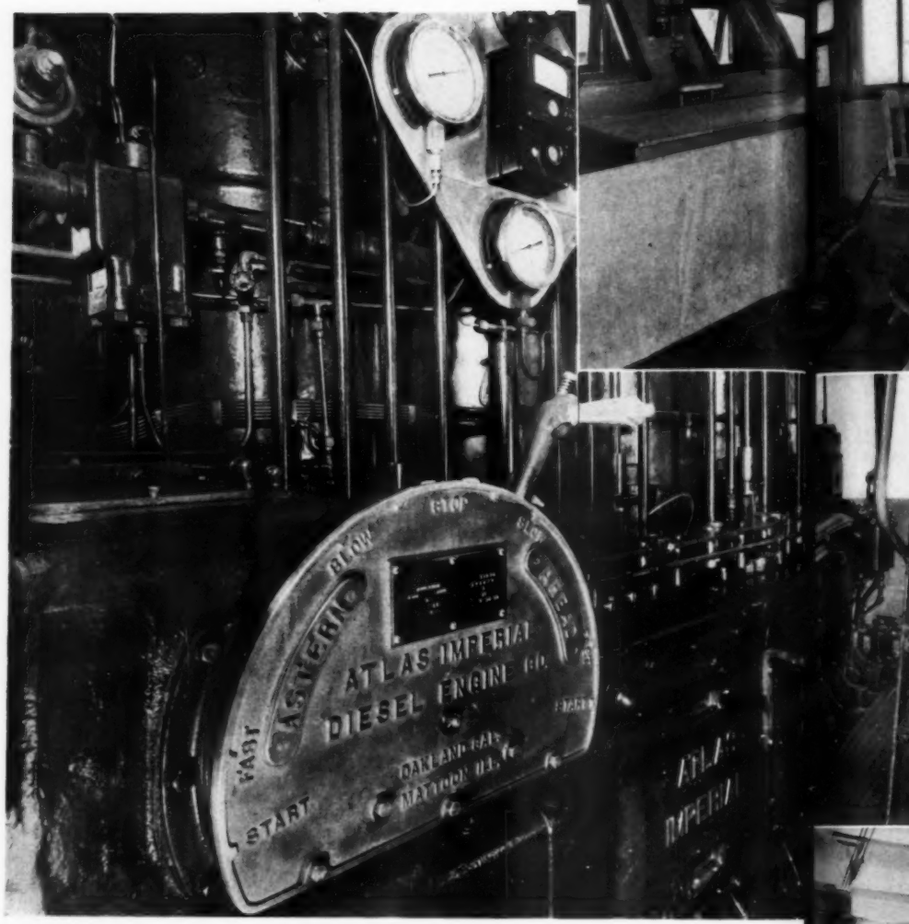
FIG. 7

DIESEL TUG "ANNA L. CONNERS"

By WILL H. FULLERTON

EACH new Diesel tug that comes along calls for stronger brands of adjectives; it is more modern or more streamlined, more powerful, more comfortable, more maneuverable or more economical—until it seems that the ultimate in tug design and construction must have been reached—but, still they come, each one outdoing its predecessors in some desirable details. And the *Anna L. Conners,* recent 81 ft. addition to the Standard Towing Corporation, New York fleet, is right up there with more of this and that. Her actual overall length is 81 ft. 4½ in., breadth 21 ft., and depth 10 ft.; she is built close to the water with raked lines that would grace many a pleasure boat. She packs a lot of power, too, for her size.

Her designs came from the boards of Merritt Demarest, Naval Architect, Tottenville, Staten Island, N. Y., and Jakobson Shipyard, Incorporated, Oyster Bay, New York, built her. She is all welded steel, as modern tugs will be while this worthy material is available for fast, sturdy construction, and she is powered with an Atlas Imperial six cylinder, four cycle, direct reversible, marine Diesel of 15 in. bore by 19 in. stroke, rated to develop 600 hp. at 300 rpm. A smooth running, alert power plant that put the *Anna L. Conners* through her paces off the Battery in the Hudson River just long enough between urgent assignments to show that she is the harbor and canal thoroughbred she was designed to be.



Upper view is the pilot house on the "Anna L. Conners." In the above view is seen the operating station of the Atlas main propulsion Diesel. Note Alnor pyrometer on the gauge board.

The main engine-attached accessories are complete and of types to insure good operation. These consist of Purolator duplex fuel filters, Alnor multipoint pyrometer, Weston tachometer, built-in fuel and lube pumps and a two-stage, water cooled, 48 cfm. air compressor. Engine room accessories include items of equipment necessary to trouble free operation and their arrangement represents careful planning as to convenience and conservation of space. A Schutte & Koerting heat exchanger serves for lube oil cooling and a shell and tube heat exchanger, built by Heat Transfer Products, Inc., handles jacket water cooling. A Hilco lube oil reclaimer is installed and a Crane oil burning boiler heats the vessel's pilot house and quarters. The shaft generator is a 10 kw. V-belted Star machine.

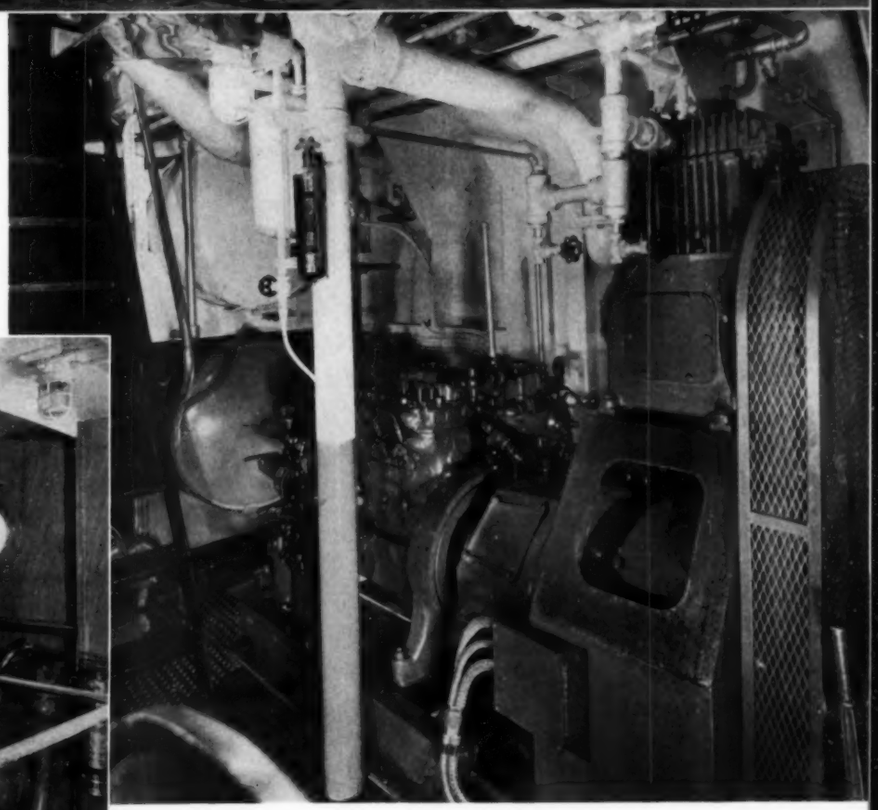
For auxiliary power there is a combination unit with a Hercules, four cycle, six cylinder Diesel rated 30 hp. at 1200 rpm. mounted on a structural steel sub-base with a direct connected 20 kw. marine type Star generator, the extended shaft of which carries a V-belt sheave for driving a Quincy, 36 cfm. air compressor. A duplicate compressor driven by a 10 hp., 1750 rpm. Star motor is separately installed. A bank of Exide Ironclad batteries floats on the line. Both main and auxiliary Diesel exhausts are silenced by Maxim spark arresting units mounted in the engine room trunk.

The auxiliary Diesel fuel injection system is American Bosch and Purolator filters handle both fuel and lube. A Carter 2 in. bronze fitted centrifugal pump driven by a Diehl 5 hp. marine type motor provides bilge and general

The all steel tug "Anna L. Conners" on trial run off the Battery in the Hudson, New York.

The marine auxiliary unit consisting of a Hercules Diesel, Quincy air compressor, and Star generator. Note Purolator lube oil filters.

Upper engine room view.



pumping service. There it is, a complete array of functional and protective equipment, organized to do a real job.

Captain's and mates' quarters are aft the pilot house; crews' quarters in the fo'csle, galley and mess in the after portion of the deck house. The demand for tug service is so great these days that the *Anna L. Conners* handled a quick job on her way from the builder's yard to her show-off runs at the Battery and as soon as this brief ceremony was over, off she went to catch up on accumulated assignments. Another fine profit making Diesel tug that will see many years of service.

LIGHT AND WATER UTILITIES DIESELIZED

By BENNETT B. SMITH

THE municipal light plant at California, Missouri, is now eight years old, having begun operation November 26, 1934. They have a neat, efficient plant operating at small cost with enough power to furnish electricity to many more patrons and communities. No effort has been made to secure REA or other contracts. One short rural line, serving less than a dozen patrons, is in operation.

A number of years ago, the city was furnished current by a steam plant which was all right for its day and a thing to be proud of in any municipality. But, like all steam plants in small places, it became expensive to operate with coal which is costly and difficult to secure. Later, two individuals attempted to operate the plant but they were not pleased and the arrangement was apparently unsatisfactory. The rate for current was fifteen cents per kilowatt which was high. The next operator was a utility company which purchased the plant, closed it, and ran a line from their plant at Sedalia, several miles west.

Agitation had already started some time before for a city owned power plant and now it reached the place where something was to be done about it.

Plans were worked out and a vote on a bond issue of $100,000 was called. It was planned that a PWA grant of $54,000 would be asked and, with $10,000 cash which the city had saved for the fund, the new plant could be erected.

The vote failed to carry. Two more attempts were made before the proposition was finally successful and the town was on its way to realize its dream. The failure of the vote in the first two elections was laid largely to the utility company fighting the proposition. The city attorney, L. P. Embry, was a fighter, however, and it is perhaps due to his work and influence that the proposition finally carried.

The building is about 40x70 feet, built of light red brick with high ceiling. The roof is of steel decking with built-up asphalt; the window frames are of steel, making the building practically fire proof. Cleanliness seems to be a motto and the building is always found in spic and span order with walls, windows, and floors appearing as if they had just undergone a house cleaning and painting.

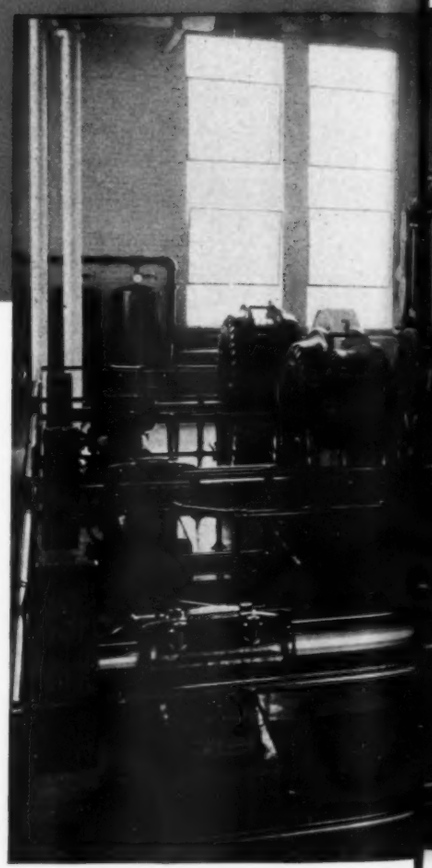
The building is surrounded by a large lawn on which trees and flowers have been planted. The whole property is situated at the west edge of town on a main highway.

The plant was equipped with three Fairbanks-Morse, 300 rpm. Diesel engines. One unit is a six-cylinder, 420 hp., while the other two are five-cylinder, 350 hp. These units will furnish power for many years to come. Woodward, type I. C., governors were used, along with Westinghouse regulator, General Electric relays, and Roller-Smith switches. Marley heat exchangers are a part of the equipment. The cooling system is a Fairbanks-Morse closed type which has operated very efficiently. Norton and Weston meters are also used in the plant. Fuel is stored in two 15,000 gallon tanks near the plant with a pipe line extending from the railroad some 2,000 feet away. Here tank cars may be spotted and the fuel pumped to the storage tanks.

Westinghouse and Sangamo type meters are used and are city owned. A deposit of $5.00 is required from homes and $10.00 from businesses.

Since the beginning of operation, the power factor was low and some months ago, to help this situation, General Electric capicators were added which has increased the power factor better than 80 per cent.

Rates for current for residences start at 7½ cents for the first 40 kwh. and extends down to three cents for all over 80 kwh. Commercial rates begin at 7½ cents for the first 40 kwh. and decreases on scale to three cents for all over 200 kwh. Minimum monthly rate is $1.00.



Three Fairbanks-Morse Diesel generating units at California, Missouri.

When the city took over the lighting and power business, it offered to buy the distributing system of the utility company but this was refused so a whole new system was built. Thus, the city started with a new plant and new distribution system—everything satisfactory for efficient and economical service. The plant has operated very efficiently, so much so that during the past eight years of twenty-four-hour service, a total of about one-half hour of shut-down has occurred. A gasoline unit furnishes starting air which is done at 250 lbs.

Employees of the plant consist of three operators who work in eight hour shifts: one superintendent, one lineman, and one man who does maintenance in the water system.

A Board of Public Works is in charge of the plant, each member being elected for a period of four years but with their terms staggered so that one new man is added each year.

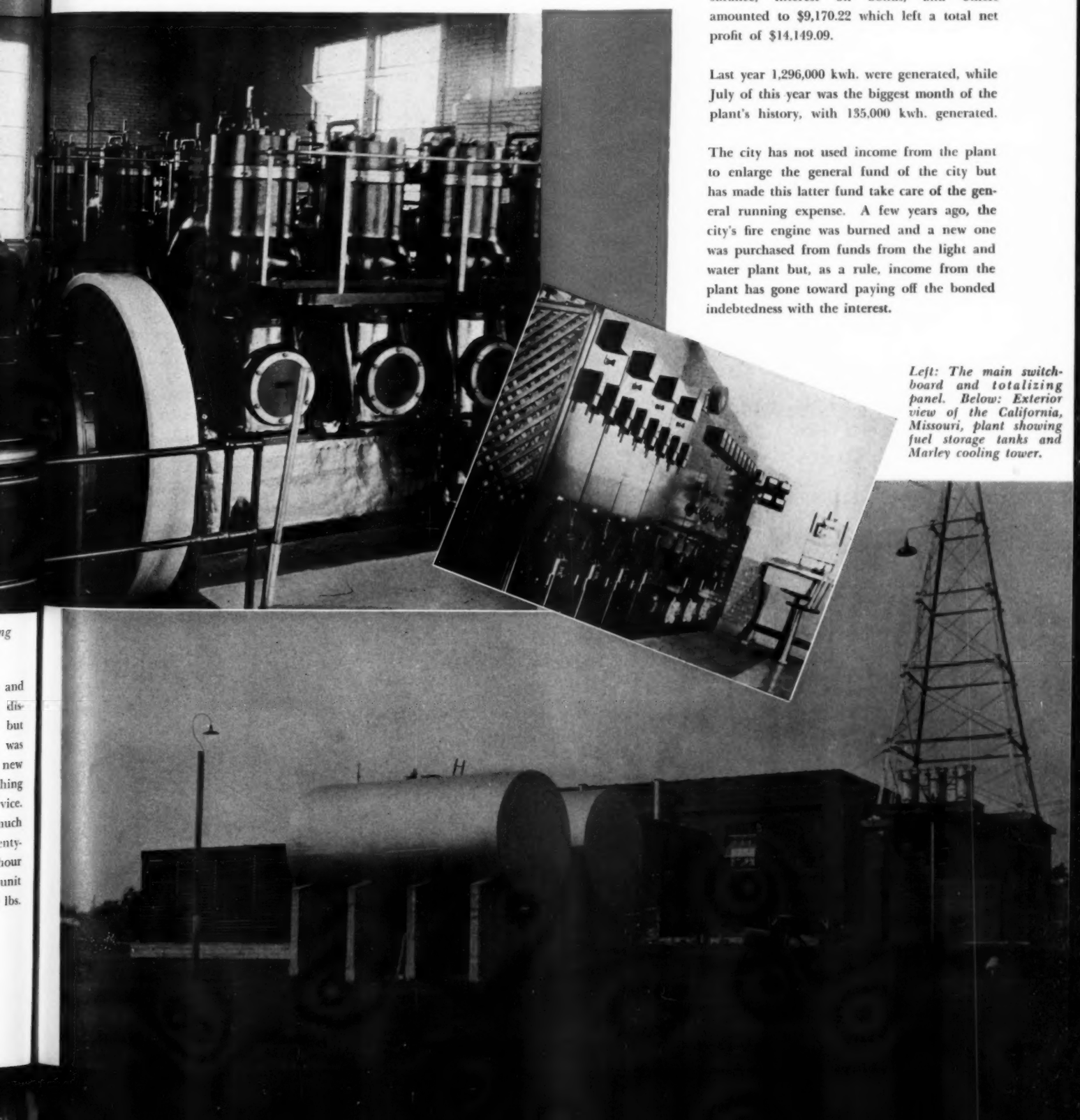
California is more fortunate than many towns of Missouri from the fact that it has an abundant supply of water underlying the city and the whole supply comes from two large wells, one 750 feet, the other 1,600 feet deep. A 40 hp. and a 60 hp. pump is amply large to furnish all the water needed. On opening up one of the wells, a test to determine the efficiency was made with water being pumped for forty-eight hours continuously at 548 gallons per minute but with the well showing no signs of failure. Water comes pure and ready for use from these wells. The state keeps a check of city water supplies but they have found no contamination or criticism of the water supply of the town of California, Missouri.

National meters are supplied the patrons on new installations but there are a number ot various old makes of meters in use in the city.

Total assets of the plant, including the water system, was reported last year as $233,428.49. The light plant with the distributing system was invoiced at $160,779.87, a depreciation of $46,107.15 being deducted. Income from the electric and water service amounted to $54,-654.12 with an expense of $31,573.46 leaving a net profit on operation of $23,319.31. Other expense, including free street light service, insurance, interest on bonds, and others amounted to $9,170.22 which left a total net profit of $14,149.09.

Last year 1,296,000 kwh. were generated, while July of this year was the biggest month of the plant's history, with 135,000 kwh. generated.

The city has not used income from the plant to enlarge the general fund of the city but has made this latter fund take care of the general running expense. A few years ago, the city's fire engine was burned and a new one was purchased from funds from the light and water plant but, as a rule, income from the plant has gone toward paying off the bonded indebtedness with the interest.



Left: The main switchboard and totalizing panel. Below: Exterior view of the California, Missouri, plant showing fuel storage tanks and Marley cooling tower.

The fifty-year-old tug "Rose Reichert" on trial runs in the Hudson River after conversion from steam to Diesel propulsion.

A REALLY OLD TUG REJUVENATED

By DWIGHT ROBISON

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THE *Rose Reichert* is a wooden tug 62.5 ft. long, 17.9 ft. beam, and 8 ft. depth, built at Tottenville, Staten Island, N. Y., in 1892. She is owned by the Reichert Towing Line of New York. Successful trials were run on the Hudson River last January after completion of her conversion from steam to Diesel propulsion at the yard of the Union Dry Dock & Repair Company, Weehawken, N. J.

Her main engine is now a six cylinder Atlas-Imperial four cycle Diesel with 13" bore and 16" stroke rated to develop 400 hp. at 300 rpm., at which speed it swings a four bladed Columbian bronze propeller wheel 70" diameter and 40" pitch. A Kingsbury thrust bearing forms an integral part of the main engine. A fresh water cooling system is installed employing a shell and tube type heat exchanger. Sea water is circulated through this heat exchanger by a 3½ in. suction, 3 in. discharge centrifugal type, reversible bronze pump, "V" belt driven from the intermediate shaft. A plunger pump built in on the engine circulates 125° fresh water through the shell of the heat exchanger whose supply is obtained from a double bulkhead tank forming the after part of the engine room trunk. Aft of this bulkhead tank there is accommodation for the crew. Forward there is also a bulkhead partitioning the engine room trunk from the galley. In the fore peak there are two cylindrical fuel oil tanks of 2000 gallons capacity each and in the aft peak there are two additional tanks of 2000 gallons each.

Three 30 in. x 96 in. starting and maneuvering air receivers are installed in the aft peak and one on the port side in the engine room.

Forward of the main engine there is an auxiliary unit consisting of a single cylinder 5½ in. x 6½ in. Atlas-Imperial four cycle Diesel rated to develop 15 hp. at 1000 rpm., direct connected by flexible coupling to a two stage Quincy air cooled air compressor having a displacement of 40 cu. ft. A 5 kw. 32 volt marine type, drip proof Star electric direct current generator is clutch connected through a "V" belt drive, as is also a 2½ in. suction, 2½ in. discharge, bronze fitted rotary pump having a capacity of 90 gpm. for bilge and general service.

A 3 kw. 32/40 volt 800/1200 rpm. variable speed Star electric marine type, drip proof dc. generator is driven by "V" belts from the intermediate shaft.

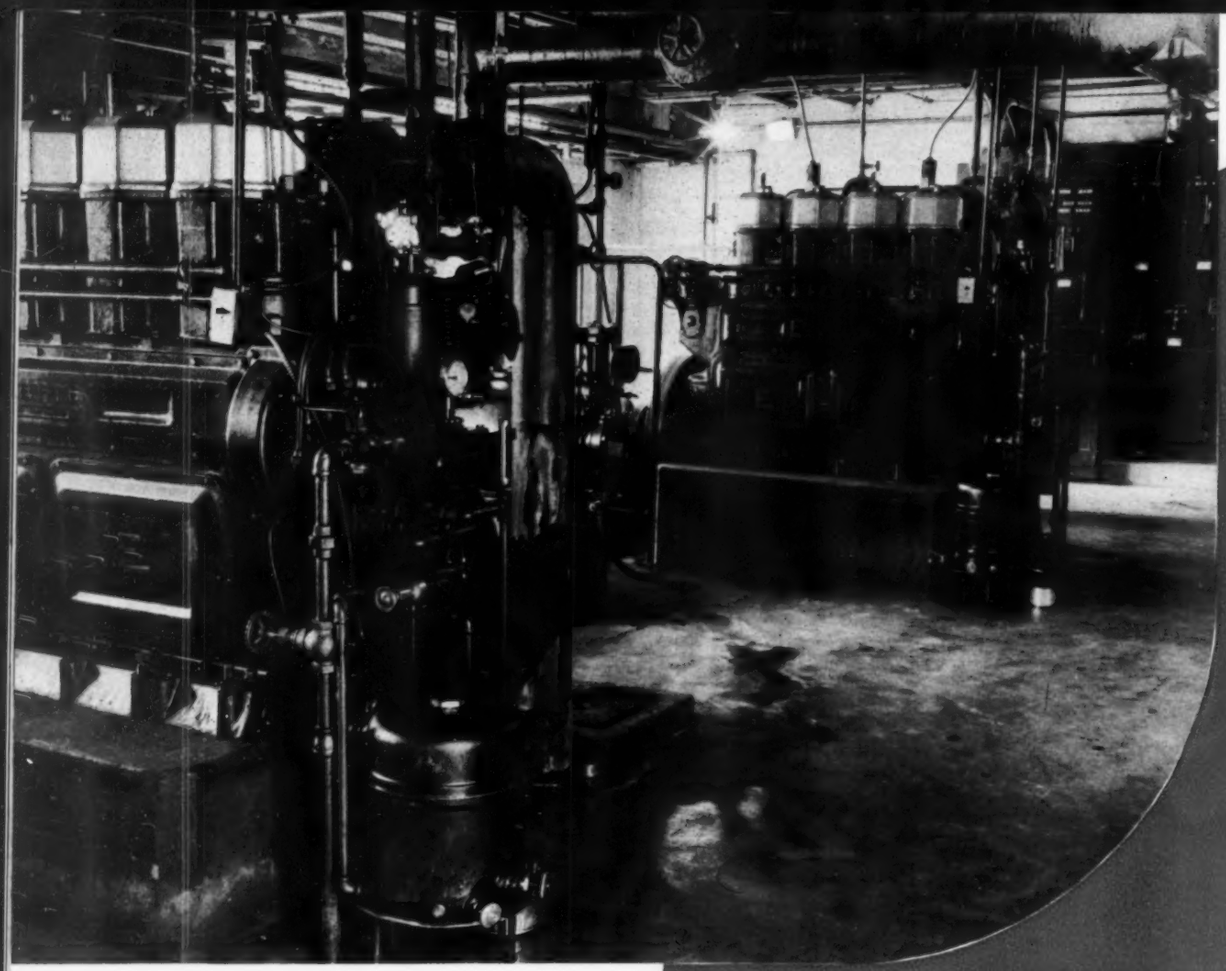
Both the auxiliary and the shaft driven generators are controlled from one panel mounted on the starboard side of the engine room opposite to the single lever control of the main engine, and this generator panel also controls the Exide Ironclad storage battery of 16 cells forming a floating system of 32 volts.

Maxim spark arresting exhaust silencers for both the main and auxiliary engines are installed in the stack mounted on the deck house immediately aft of the pilot house. On this latter there is mounted a duplex air horn supplied from the starting and maneuvering air receivers. The heating system is served by an oil burning boiler installed on the port side forward in the engine room.

The main engine is equipped with an Alnor exhaust pyrometer and Weston tachometer to check the exhaust temperature of each cylinder and the revolutions, respectively.

Credit of this conversion goes to Captain Francis J. Reichert, who has supervised the work performed by the Union Dry Dock and Repair Company, with the cooperation of the Atlas Imperial Diesel Engine Company. All are to be congratulated on the result evidenced by the splendid performance of the tug now hard at work to fill a long felt want of the Reichert Towing Line.

Operating side of the new Atlas Diesel installed in the "Rose Reichert." This is a six cylinder direct reversing marine unit rated to develop 400 hp. at 300 rpm.



Two Enterprise natural gas engines each driving a compressor and one driving a Westinghouse generator. Note Michiana lube filters.

GAS ENGINES REDUCRAN

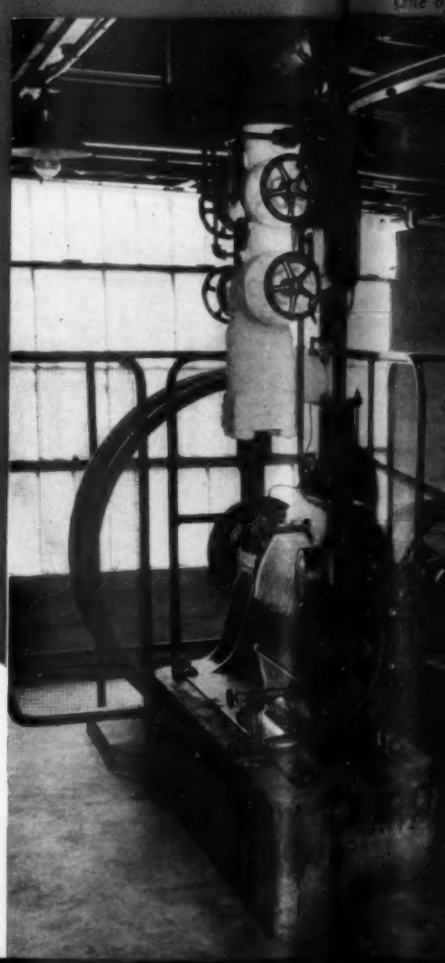
By JIM MEDFORD

CALIFORNIA grows 60 per cent of all the oranges and 95 per cent of all the lemons consumed in the United States and Canada. This foremost agricultural industry returns to the Golden State in excess of 100 million dollars annually from 340,000 acres, supporting more than 200,000 of the state's population. Ninety per cent of the crop is cooperatively marketed, of which 75 per cent is by the California Fruit Growers Association under their world famous "Sunkist" trade mark indelibly stamped with vegetable ink by automatic machines on the "cream of the crop."

Transportation and refrigeration play important parts in this industry. Seventy thousand refrigerated railway cars, 41 per cent of those in service, requiring approximately 3,250,000 tons of ice or one-tenth of this country's production, are required to market the 30,000,000 boxes of oranges of a full crop year.

Maturity of the fruit is determined by a careful analysis of the sugar content of representative samples taken from groves before actual picking is begun. As the boxes of oranges arrive from the groves they are allowed to stand for at least a day at the packing house to permit skin moisture to partially evaporate easing the chance of injury in handling. In the packing house, the fruit is handled in the most sanitary and careful way, thoroughly washed and handled only by gloved hands. As in all industrial activity, here and there in the citrus packing houses attention has been given the rising cost of purchased power. Among those that did something about reducing power cost was the Damerel-Allison Association of Covins, Los Angeles county, and, today, in one of the most modern plants of its kind, natural gas engines are carrying the full power load for every phase of preparing California's golden harvest for domestic and export markets.

Two Enterprise gas engines V-belted to two ammonia compressors and a 220-volt generator supply power for packing operations, precooling, ice manufacture and all lighting requirements. These engines are four cylinder 8 in. x 10 in., rated 120 hp. at 600 rpm. No. 1 drives a 60-ton ammonia compressor and the No. 2



Packing room in the Damerel-Allison Association plant.

UCRANGE PACKING COST

ORD

One of the engine-compressor sets. Note American Bosch twin magneto.

serves a 25-ton ammonia compressor, as well as driving a 50 cycle, 78 kva., 1,000 rpm. Westinghouse generator.

The Damerel-Allison Association was established in 1901 by Harry Damerel and Herman Allison and the orange packing plant changed over from purchased electric energy to gas engines in 1938. Since their installation over four years ago, less than thirty minutes' delay can be charged against these engines, according to Chief Engineer Robert Hall. Seasonal shipments from this plant average 600 carloads of 462 standard boxes per car. Ice manufacturing capacity is 40 daily tons in 300-pound cakes with storage holding 1,200 cakes. Precooling room is in ten sections holding a total of 26,000 boxes of fruit at 32 degrees by means of air washed brine spray system. In addition to other employees, there are an average of twenty-two women packers turning out between 1,400 and 1,500 boxes in the eight-hour working day.

Additional important equipment items include: generator by Westinghouse; governors by Pickering; dual ignition by American Bosch; air filtered by Vortox; exhaust silenced by Maxim; water pumps by Worthington; switchboard and gear by Westinghouse, General Electric and Trumbell; ammonia compressors by York; 1-ton crane by Sheppard; Power-plus fuel mixer; lube oil pressure control by Minneapolis-Honeywell; cooling system thermo control valves by Friez; ammonia line gauges by Mercoid; lube oil filter by Michiana; lube oil is Penn-Bell; lubricators by Manzel.

POWERFUL DIESEL TOWBOAT "JAMES E. GRAHAM"

By R. D. CAMPBELL

"SHE is not the biggest nor the fanciest boat on the river, but she has plenty of power and maneuverability." Thus, in one sentence Captain William M. Ripley expressed his opinion of the *Graham* after having put her through several weeks of the most exacting and gruelling type of service. Mr. H. A. Gipson, one of the owners, expressed his views almost as briefly as did Captain Ripley. "We built this boat to work and make a profit. The frills and fancy trim were omitted, but we were careful to include every item necessary to good operation. She is small enough to work in the smaller rivers which have a narrow channel and only six feet of water, but she has the power to buck the Mississippi with a full tow of barges."

The *Graham* was designed and built by her owners, the Industrial Marine Service of Memphis, Tennessee. The hull is all-welded steel construction and measures 89′ by 19′ by 7′, with a gross tonnage rating of 63 tons. The vessel has a draft of 5′ 6″ when fully bunkered, and only 4′ 10″ when light. The bow of the *Graham* is a plain rake or scow nose, while the stern has a tunnel design which houses a single propeller and three rudders. The superstructure is of wooden frame construction with maple flooring throughout.

The heart of any boat is the main engine, and the owners selected a 450 hp. Fairbanks-Morse Diesel to handle this important assignment. This engine is of the two cycle type, and has six 14″ x 17″ cylinders which develop the full rated horsepower at 300 rpm. with a bmep. of 40 pounds per square inch. This type of engine needs no introduction to boat men, for it has a fine record for dependability and service on the inland waters, along the coast, and in fishing service.

In the *Graham*, the F-M Diesel is located in the middle section of the hold and is directly connected to the propeller through a main and tail shaft which are supported in rigid bearings. The tail shaft passes through a Goodrich "Cutless" stern tube bearing and carries in the tunnel a three-blade, 58″ diameter by 52″ pitch Kahlenberg cast steel propeller.

The *Graham* was placed in service on July 23, at which time she left Memphis for Baton Rouge. Reaching Baton Rouge three days later, she took on a tow of five barges of gasoline. The barges were pushed up the Mississippi and Ohio Rivers to Maysville, Kentucky, a distance of 195 miles above Louisville. On August 9, the *Graham* handled several empty barges from Maysville to Baton Rouge. She then went on down the river and westward in the intracoastal canal where she picked up a tow of six barges of gasoline near the 185-mile post. This tow was brought eastward in the canal and up the Mississippi to Baton Rouge. It was during this return trip along the canal that Captain Ripley received many favorable comments regarding the maneuverability of the *Graham*. The canal has a channel only 100 feet wide and, in places, its course consists of a series of rather sharp and arduous turns. Several experienced towboat men were surprised to find that the boat had a single screw, as it was their experience that only twin screws could manage such a large tow in these waters.

The pride which the crew evidenced in pointing out her features and praising her performance was of greater significance than their spoken words. All hands agreed she had plenty of power and maneuverability. The deck hands were enthusiastic about her freedom from vibration. Vibration can be particularly annoying to those who walk the deck and to deck hands whose quarters are aft of the engine room and over the propeller. But they said she was free of this annoyance. Even the cook was proud of the *Graham* and pointed out that the galley was located on the forward deck where it was not only cool but commanded a good view.

Fuel is carried in compartments extending the entire length of both sides of the hull. Capacity of these compartments is more than 10,000 gallons which is sufficient for twenty days of continuous full load operation. An indirect cooling system is used, insuring clean soft water in the engine jackets circulated by means of a built-in reversible centrifugal pump. A series of six rectangular shaped passages built into the bottom of the hull insures an active transfer of jacket heat at all times. While six such passages have been provided, it has been found only four are necessary for normal conditions.

Since the Model 35 F-M Diesel is designed specially for marine service, the arrangement of her auxiliaries is in keeping with best towboat practice. Such features include: direct reversibility, built-in pressure lubrication, built-in reversible pumps at forward end, built-in air compressor, built-in thrust bearing and provision for remote control. An Alnor pyrometer on the forward end of the engine indicates exhaust gas temperatures. Individual cooling water thermometers indicate jacket water temperatures. Weston Tachometers located on the engine and in the pilot house indicate rotative speeds in both directions.

Other accessories used on the *Graham* include: Honan-Crane lubricating oil purifier, a 12 kw. Diesel G-M engine generator unit, a 19-inch Carlyle-Finch searchlight, a Fairbanks-Morse

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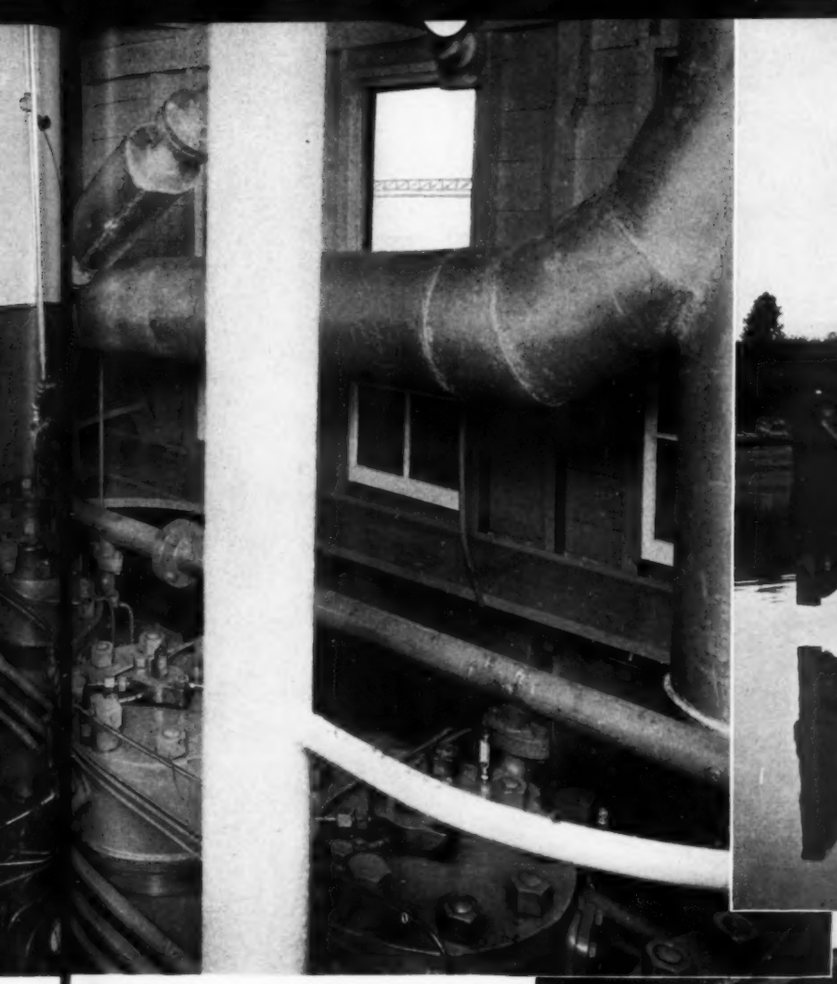


Above: The F-M propulsion Diesel. Upper right: The "James E. Graham" is comparatively small but unusually powerful, as towboats go. Right: Pilot house view showing F-M remote engine controls and Weston Tachometer.

fresh water system to supply fresh drinking and cooking water under controlled pressure to various points on the boat; and Ingersoll-Rand air compressor to operate the steering mechanism.

Steering equipment is worthy of special mention as it was designed by the owners, and accounts in a large measure for the exceptional maneuverability of the vessel. It consists of three rudders, one main rudder and two backing rudders, which are interconnected in such a manner that all three help steer the boat in both forward and backing operations. The one main rudder is located directly aft of the propeller, and the two backing rudders are located forward and to either side of the propeller.

The chocks, kevels, and numerous other items were designed and built by the Industrial Marine Service, owners of the *Graham*. From the general design of the boat and the selection of the main engine down to the minute details, the *James E. Graham* clearly bears the marks of having been designed by experienced river boat men.

DIESEL TRACTOR CLEARS STORM WRECKAGE

By DOUGLAS SHEARING

AFTER the calm—the storm. And after the storm, a Diesel tractor helps clear away the debris. When a tornado roared through the quiet little city of Lacon, Illinois, twenty-five miles upriver from Peoria, several persons were killed and property damage was estimated at more than a half-million dollars. Scores upon scores of towering trees, for which Lacon was known far and wide, were uprooted, broken off, or otherwise damaged to such extent that they had to be removed. Among the equipment at work during the clean-up was this sturdy machine, loaned to Lacon city officials by Caterpillar Tractor Company. Shown working in the heart of the devastated area, the tractor helped remove stumps and then filled up the resulting holes, speeding up work to a remarkable extent.

BUSCH-SULZER AWARDED THE NAVY E

Edward B. Pollister, President of Busch-Sulzer Bros.-Diesel Engine Company; Rear Admiral William H. P. Blandy; Mrs. T. Randolph Potter, great granddaughter of the late Adolphus Busch; and Mayor W. D. Becker of St. Louis outstretching the Navy E burgee.

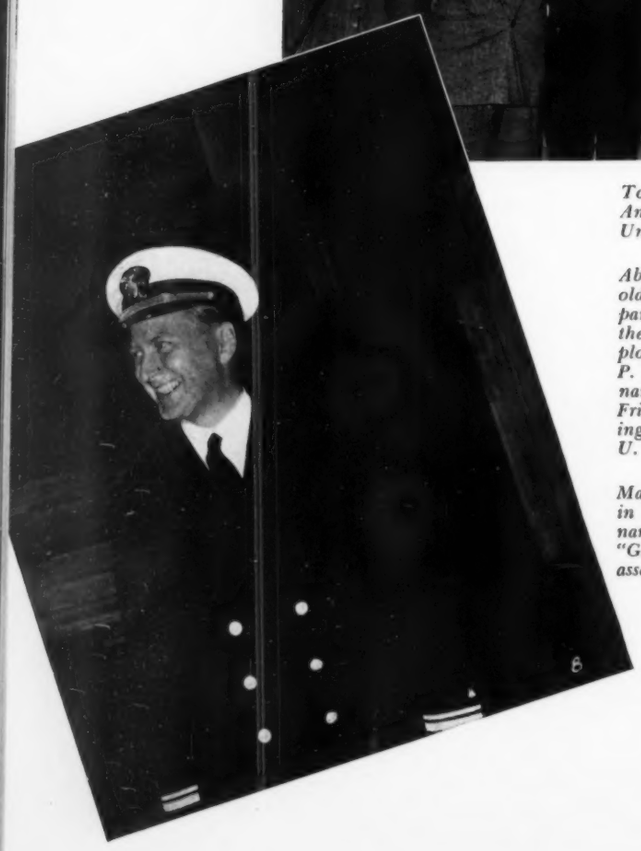
The Navy E burgee as it proudly flew from the mast outside the head office of the Busch-Sulzer Bros.-Diesel Engine Company, 2nd and Utah, St. Louis, immediately after presentation exercises.

Rear Admiral William H. P. Blandy, Chief of the Bureau of Ordnance, U. S. Navy, "coming aboard" to say "well done" to the 1,350 employees of the Busch-Sulzer Bros.-Diesel Engine Company.

ON May 9, at the plant on Second at Utah in St. Louis, Rear Admiral William H. P. Blandy, Chief of the Bureau of Ordnance, U. S. Navy, presented the Navy E pennant to the Busch-Sulzer Bros.-Diesel Engine Company in token of the Navy's appreciation for the manner in which this Diesel engine manufacturer has cooperated with and worked for the Navy Department in producing vital requirements of the Bureau of Ordnance ahead of schedule and in larger quantities than had even been hoped for. The Navy's prize E burgee was accepted by Edward B. Pollister, President of Busch-Sulzer Bros.-Diesel Engine Company on behalf of the 1,350 workers who have each individually contributed their part to the record of production of which the Navy is so proud. As Admiral Blandy told them in his brilliant, concise speech, "You men and women have been turning out vital units for the Navy; you are 50% ahead of schedule and we are proud of you." The award of the Navy E for outstanding production achievement to the Busch-Sulzer Bros.-Diesel Engine Company is of two-fold significance. Not only does it signify the Navy's recognition of the enthusiasm and fine work of the management and men and women in the plant but it honors the company that gave birth to the first Diesel engine in the world to be built for commercial purposes. Adolphus Busch, who founded the institution of Anheuser-Busch, founded the company which is today known as the Busch-Sulzer Bros.-Diesel Engine Company and retained Dr. Rudolph Diesel as consultant. As stated above, the first commercial Diesel engine in the world was built by this company and was installed in Anheuser-Busch's power plant in 1898, forty-four years ago.

THE NAVY E TO NORDBERG

By REX W. WADMAN



Top: Speakers' platform as the National Anthem was played and the flag of these United States raised to the masthead.

Above: (left to right) Hans Krogstad, the oldest Nordberg employee (with the Company for over fifty years), who accepted the Navy E buttons on behalf of the employee group; Rear Admiral William H. P. Blandy, Chief of the Bureau of Ordnance, United States Navy; Robert E. Friend, President, Nordberg Manufacturing Company; Captain H. A. Spanagel, U. S. Navy.

Mayor Carl F. Zeidler, now a Lieutenant in the U. S. Naval Reserve, whose dynamic speech and singing of the song, "God Bless America," brought this huge assembly to its feet, cheering.

MILWAUKEE, Wisconsin, May 15, 1942—Here, in the new addition to the plant which was specifically built to handle urgent armament requirements, the prized Navy E pennant was awarded to the Nordberg Manufacturing Company by Rear Admiral William H. P. Blandy, Chief of the Bureau of Ordnance, United States Navy. It was an impressive sight this afternoon to have this award made within the plant structure itself to an audience of over 3,000 employees of Nordberg who contributed their share to the record which caused the Navy to say "well done." Standing on top of partially finished Diesel engines, on machine tools, which for the first time in months were inactive, these workmen listened to a short but very impressive ceremony. The speech of Robert E. Friend, President of the Nordberg Manufacturing Company, was particularly well timed, well worded, and well delivered, and it came from the heart. During the past few months it has been my pleasure to attend the presentation of the Navy E Burgee to a number of plants connected directly with the Diesel Industry and I have had an opportunity of measuring the degree of cooperation existing between the workmen and the plant managers. Here in this Nordberg plant this afternoon there was a bond of friendliness that existed between Bob Friend, their President, and the men and women who are doing the work here which was obvious to any and all of us who witnessed this ceremony. It was a heartening experience to find such a splendid spirit of cooperation between the front office and the shop because this is one of the hardest things to obtain and to hold in these high pressure days and rapid expansion of the working force. All in all, the Navy E day at Nordberg was a highly successful one and the ceremony itself very impressive. My congratulations to Nordberg, and to the men and women who earned the Navy E.

START 'EM FAST START 'EM EASY

AUTO-LITE *TWO STEP* STARTERS FOR DIESELS

Auto-Lite provides the excess margin of starting power so essential in Diesel operation with a revolutionary new starter which cranks on full voltage. But to reduce possibility of damage to housing, pinion and ring gear, meshing is accomplished on reduced voltage. The result is quieter, more efficient operation and a Diesel starting system that is fast in action and easy to maintain.

Auto-Lite also provides shunt generators for 12, 24 or 32 volt systems: 100 to 2500 watts capacities. Auto-Lite Heavy-Duty Regulators have 3 units—voltage, current and cut-out relay—in one water and dust-proof assembly. Maintain voltage to plus or minus 2%.

Auto-Lite starting and generating systems for diesels are designed and built by the world's largest independent manufacturer of automotive electrical equipment. For prices and complete details, write to

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"THE EFFECT OF 'WAR TIME' ON PLANT OPERATION"

By R. L. GREGORY*

WHEN our present "War Time" policy was adopted by the country last February, a storm of protest arose among people in every walk of life, as many felt that no benefits would be derived from the adoption of such a policy. There are still many laymen and perhaps members of Power Plant personnels, especially those who have not taken the opportunity to check up on the results, who feel that these benefits do not warrant the change.

One of our bottlenecks for several years past has been a shortage of power and power facilities. This has been especially true since Defense work and Lease-Lend Production has been in vogue. The primary object of those favoring the adoption of the "War Time" policy was to make power available for production, by eliminating or restricting insofar as possible current used for lighting purposes. They felt that if more daylight hours could be obtained, shifts rearranged or staggered, more current would be available for the operation of machines, and less would be necessitated for lighting purposes.

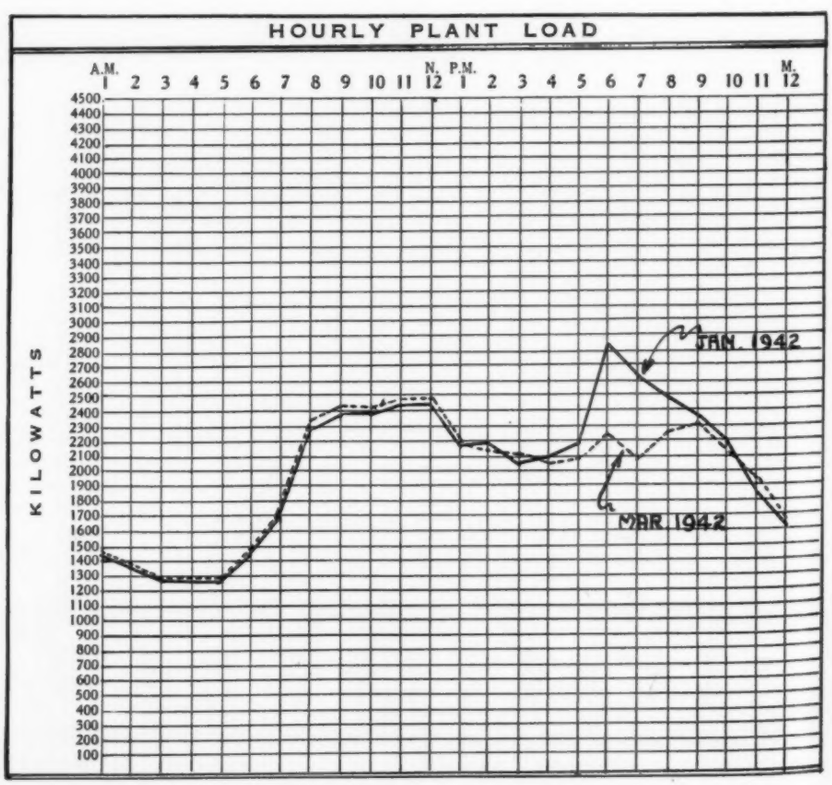
The illustration shown herewith gives some idea of the effect of this change upon the load of a midwest municipal plant which furnishes current for many manufacturing establishments. What is true in the operation of this plant is also true in the operation of larger utilities and industrial plants.

The heavy line denotes the average hourly load conditions during a twenty-four hour period during the month of January, before the new time was adopted. The broken line denotes the average hourly load conditions during the month of March, after the change in time was adopted. A study of this illustration shows a high increase of load from approximately 5 P.M. until 9 P.M. during the month of January. During the month of March, this load has been straightened out considerably. Of course, a portion of this drop-off in March can be attributed to longer daylight hours in March, but this is a very small proportion; that is, had there been no change in time, the load would have dropped somewhat during this period.

But the bulk of it was due to change in time. With an hour more of available daylight during March, many housewives got their meals without the use of lights. Stores which closed at six P.M. did not need lights for the last couple of hours before closing. Commercial lighting and advertising and street lighting were not in use during the period of stove operation and industry did not have to use lights while the domestic cooking load was in operation.

Some explanation of "Peak Loads" might be mentioned. During January, with the combination of domestic load, commercial and street lighting, industrial lighting, and power use, the peak loads during the evening hours exceeded the average hourly load by from 600 to 700 kw. During March, with the longer

. . . *Now please turn to page 63* . . .

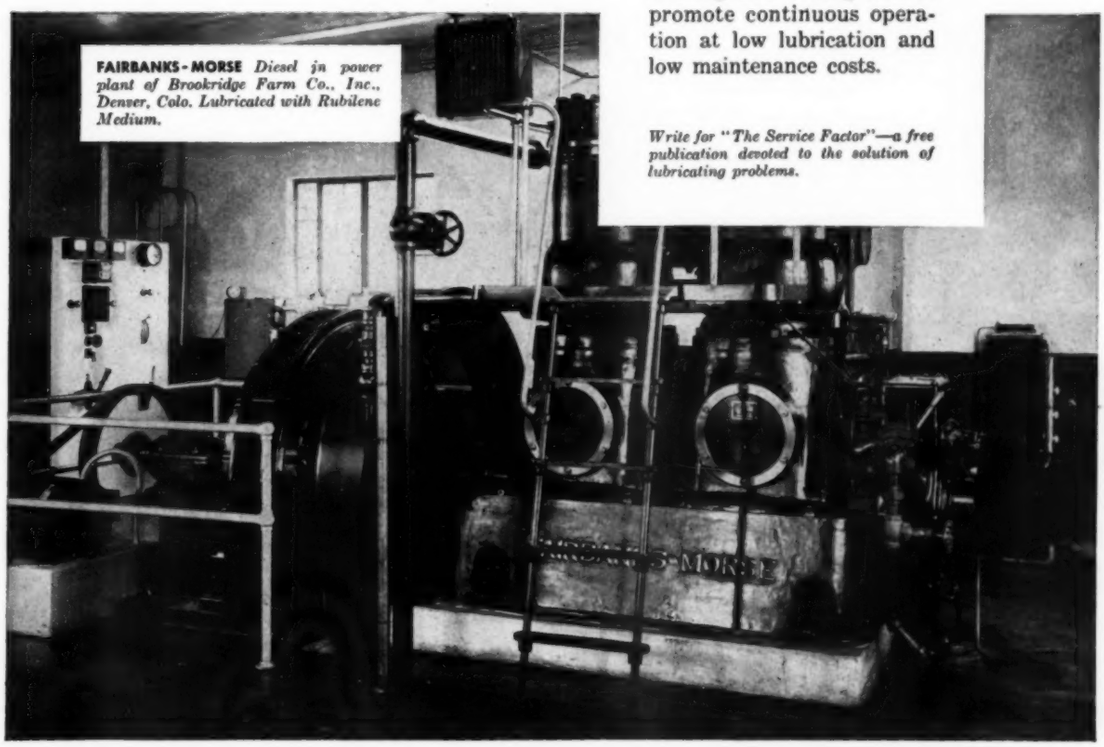


* *Chief Engineer, Municipal Water and Light Plant, Hillsdale, Michigan.*

ALL-OUT WAR EFFORT demands maximum engine performance. For lubrication that helps *DIESEL ENGINES* to deliver sustained full power output use . . .

. . . . . **SINCLAIR RUBILENE OILS.** They are designed to prevent ring-sticking and scoring and to promote continuous operation at low lubrication and low maintenance costs.

Write for "The Service Factor"—a free publication devoted to the solution of lubricating problems.



FAIRBANKS-MORSE *Diesel in power plant of Brookridge Farm Co., Inc., Denver, Colo. Lubricated with Rubilene Medium.*

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"Uphill & Downhill" Saved by Diesels

. . . . *Continued from page 39* . . . .

ated, and has already achieved many world records in cost of building its own giant steam locomotives. Diesels are tested to the breaking point on this system, and so far have found a favorable niche in the operating structure of this heavy hauler of freight over the short Northern line just below the Canadian Boundary. The G.N., half owner of the Burlington, has watched the passenger development from the sidelines. After eight years of watching, it is going in for Freight Diesels—Not passenger! A matter for the observer to ponder over.

We are indebted to Mr. I. G. Poole, Great Northern Master Mechanic in Spokane, for taking three hours off and giving us the inside stuff in great detail on the operation of the new SCAP Line Diesels. Mr. Poole, together with Mr. A. J. Mayhan, have nursed the electrified SCAP line for years, and are now holding the carefully warmed bottle for the new Diesel program.

Navy "E" to American Blower

AMERICAN Blower Corporation, pioneer in the development and manufacture of Fluid Drives (Hydraulic Couplings) in America, received official recognition of its contribution to the War Effort May 14, when Rear Admiral John Downes, U.S.N., Commandant, Ninth Naval District, presented the Navy "E"

Rear Admiral John Downes, Commandant from the Ninth Naval District, looks over the testing of an American Blower Fluid Drive at the Russell Street Plant of the American Blower Corporation, Detroit, Michigan. Reading from left to right—Lieut. B. M. Powell, Ensign T. D. Peterson, Lieut. Comdr. Ernest L. Johnson, Oren Freer of American Blower, Rear Admiral Downes, and Clark T. Morse, President of the American Blower Corporation. The high Navy officials were in Detroit May 14 to present the Navy "E" Burgee to American Blower for outstanding performance in the production of Fluid Drives and other naval material.

Burgee, awarded by the Navy Department for outstanding performance in the production of Fluid Drives and other naval material.

employees of Tireman Avenue and Russell Street Plants, and their families, witnessed formal presentation of "E" insignia by Commander Robert Velz, U.S.N., Inspector of Naval Material, Detroit. Charles Goetsch and Christopher Kirn, oldest employees in point of service, accepted the insignia in behalf of their fellow workers.

Award of the coveted Navy "E" to American Blower climaxes more than a decade of pioneering in the development and application of the Fluid Drives in this country. The company, in its Russell Street Plant, began manufacture of Fluid Drives for marine use in 1932 Subsequent improvements in design and manufacturing methods have made it possible to utilize the Fluid Drives in widely varied ways.

American Blower, for many months, has been on an "all-out for Victory" schedule, producing not only Fluid Drives and other special equipment for the U. S. Navy, but Industrial Blowers, Forced Draft Fans, and various other types of Air Handling Equipment for war work in factories of the Defense Plant Corporation, the U. S. Army Air Corps, the Ordnance Dept., and the U. S. Maritime Com. The Color Guard of the Naval Training School, Detroit, and the Navy Service School Band participated in the ceremonies. S. L. A. Marshall, news analyst and commentator, was chairman.

Supervising and Operating Engineers' Section

. . . . *Continued from page 60* . . . .

daylight period, this peak only exceeded the average hourly load by from 200 to 300 kw. During January, the morning peak from 6 A.M. to 8 A.M. exceeded the average hourly load by approximately 300 to 450 kw. During March, this had dropped from 100 to 150 kw. This meant that during March the high peaks had been eliminated and the load evened out, thus giving more current available for production uses during this period.

A further study of the chart shows that the average hourly load was higher during the hours of 7 A.M. to 9 P.M. in March than it was in January. This can be attributed to a larger use of power for industrial purposes and a lighter use of lighting current.

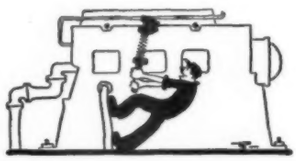
How does this help the power situation? Well, in most of the average Municipal or Industrial plants, but more particularly the Municipal plants, smaller units are used in generation. In instances of Diesel installations, few plants have units of over 3000 kw. capacity. If you are operating a plant of this nature, your 3000 kw. unit will handle a load such as shown on the chart for all periods of the day except the peak load periods. When the peak load periods arrive, you are compelled to put an additional unit in service to insure uninterrupted service to handle that peak. If you can eliminate these peaks and carry your load well

within the range of the 3000 unit, you eliminate the necessity of starting the second unit, thus saving fuel, wear and tear of machinery.

Another point of interest is that your units will operate to much better advantage if the load is steady and uniform, the peaks and swings kept to a minimum, than if the load is "all over the map" as we often hear.

With uniform operation, better efficiency is obtained and better operating practice secured. If you are desirous of giving several days to maintenance, you can accomplish a much better job on a unit than you can if you have to do your maintenance on the run and have a unit available to pick up excessive peaks every time they occur.

What is true of the average smaller plants is also true of the big central stations, since their peak loads are also in proportion to the average hourly load. They all maintain or try to maintain a high standard of efficiency and load factor and when their peaks occur, they are forced to put additional units in service. If these peaks can be eliminated, therefore, and the load straightened out, it seems that the change to "War Time" has accomplished a purpose, and it can be done by the proper cooperation of all concerned.



60 Page Pedrick Service Manual Just Announced

THE WILKENING Manufacturing Co. of Philadelphia and Toronto, maker of Pedrick piston rings, has just issued a new and up-to-date Manual on motor reconditioning called the "Pedrick Service Manual." It is the very latest in its field and is expected to render a valuable reference and educational service for the duration.

In its sixty pages will be found a most practical discussion and guide to the best accepted practices in general motor reconditioning, with special emphasis on piston ring installations. More than two-thirds of the book is devoted to a general discussion which is equally applicable to automotive engines, small power plants, and stationary engines such as are frequently used in the compression and refrigeration fields.

The entire Manual is generously illustrated with photographs, drawings and charts. Coming at a time when service is the most important phase of every business and when up-to-date information is greatly needed by engineers, maintenance men, mechanics, and students everywhere, the new "Pedrick Service Manual" should be a worthy contribution to the country's War Effort on the home front.

Anyone interested in having a copy should get in touch with his nearest Pedrick jobber through whom the distribution of the new Manual will be handled.

Walter Geist Elected President of Allis-Chalmers

MAX W. Babb, Board Chairman of the Allis-Chalmers Manufacturing Company, has announced that Walter Geist was elected president of this large company at a meeting of the Board of Directors held in Milwaukee on May 7. In this capacity Mr. Geist wil replace Mr. W. C. Buchanan, whose resignation was forced by ill health a few weeks ago. Thus, a man who entered the company's employ as an errand boy in 1909, now only 48 years of age, takes over control of Allis-Chalmers.

The story of the rise of this once struggling and ambitious youngster, who pulled himself up to his present position by his bootstraps, is the story of free enterprise and its incentive to ambition; it's a story of the American way of life.

Cooper-Bessemer Expands Plant Facilities

NEW buildings and equipment, which will practically double its productive capacity of Diesel engines, are reported being erected by The Cooper-Bessemer Corporation of Mount Vernon at its Grove City, Pa., plant. Announcement of the new expansion was made by B. B. Williams, Cooper-Bessemer president and board chairman. The project is financed under a plant facilities contract authorized by the Bureau of Ships, Navy Department.

Principal element involved in the present project is construction of two new buildings which will vacate, for increased Diesel engine production, space heretofore utilized for storage.

The Cooper-Bessemer Corporation, one of the nation's oldest engine building concerns, having started business in 1833, has been operating at full capacity for many months. Production of Diesel engines for 1941 was much greater than for 1940. Need for the company's products is attested by the great increase in workers. Today, the number of employes is 50% over January, 1941.

Gray Marine Institutes Dealers' Interchange Service

THE Gray Marine Motor Company has recently organized a Dealers' Interchange Service to which all their dealers are invited to send in lists of what they consider excess stock for their particular locality. Gray Marine will prepare a bulletin every second week to contain enumerations of this material and where each item may be procured, and then copies of this bulletin will be sent to the other distributors.

The initial effort for this program worked out so well that the next list will be sent to boatbuilders also. There is no charge for this service, for Gray Marine Motor Company does not handle the merchandise, merely listing details and where the stock can be obtained.

West Coast Diesel News

FAIRBANKS, Morse & Company is now located in new and larger quarters at 630 Third Street, San Francisco, California. The building is of modern concrete construction with 45,000 square feet of floor space. Ralph M. Murray is branch manager in charge.

ATLAS Imperial Diesels have been selected to power two halibut boats under construction by the Hansen Boat Works, Seattle, Washington; a 135 hp. in the 65-ftr. for Sverre Jangaard, and a 110 hp. in the other for Pete Wold.

A NEW 71 ft. tuna clipper under construction by the Campbell Machine Company, San Diego, California, for Manuel Madruga will have as main engine a 125 hp. Union Diesel. Boat has capacity of 75 tons and accommodations for nine.

PACIFIC Boat Building Company, Tacoma, Washington, has completed the 80 ft. seiner *Victory* for the Oceanic Fisheries, Inc. A sister ship is due for launching. Both are powered with 250 hp. Atlas Imperial Diesels.

OREGON sales of Lorimer Diesels include a 30 hp. engine to W. H. Marchand for his new 38 ft. shark fishing boat, and a 45 hp. engine to Glenn Brooks for a 43 ft. double ender.

TIDINGS, an 82 ft. herring seiner, built by the Peter Boat Building Company, Tacoma,

Washington, for Lee H. Wakefield, is powered with a 220 hp. Atlas Imperial Diesel. She will fish in Alaskan waters for the Apex Fish Co.

CAPTAIN Haakon Thompson, Port Madison, Washington, has selected his second Lorimer Diesel to power his new 52 ft. shark boat. This is a 60 hp. engine; a 45 hp. engine is in Captain Thompson's *Invader*.

THREE shrimp trawlers built at Guaymas, Mexico, by the Construcciones Navales de Guaymas for Cia. Productos Marinos de Guaymas, are powered with 4 cylinder, 90 hp. Atlas Imperial Diesels, and 20 hp. auxiliaries of same make.

THE 110 ft. tuna clipper *Queen Amelia*, by the Campbell Machine Co., San Diego, California, for Tony Tavares and associates, is powered with a 6 cylinder, 350 hp. Union Diesel. Auxiliaries of the same make, 100 hp. direct connected to General Electric generators, supply power and lighting.

ADMIRALTY, George James' 50 ft. seine boat, Seattle, Washington, is repowered with a 6 cylinder, 165 hp. Gray Marine Diesel with 3-to-1 Twin Disc gears. New 32-volt Exide batteries were also installed.

AMONG the smaller Atlas Imperial Diesel installations are a 70 hp. engine by the Canadian White Pine Co., Ltd., Vancouver, B. C., in their new 32 ft. tug; and a 90 hp. engine in the 62 ft. passenger vessel *Concordia* on the Tacoma-Quartermaster Harbor run on Puget Sound, Washington.

TO the rapidly growing fleet of small towboats on the Columbia and Willamette Rivers in Oregon has been added a 42 footer with twin Cummins Diesels by the Westerlund Boat Yard, Portland, for the Mirene Company of the same city.

ANNA MARIE, 50 ft. cannery tender of the Burnett Inlet Salmon Co., Wrangell, Alaska, has been repowered with a 6 cylinder, 165 hp. Gray Marine Diesel with 3-to-1 heavy duty Twin Disc gears from Evans Engine and Equipment Co., Seattle, Washington.

SUPERIOR twin Diesels of 100 hp. each have been installed in the 76 ft. by 24 ft. power scow *Eyak* by Maritime Shipyards, Seattle, Washington, for the New England Fish Co. This vessel will operate on the Copper River flats for the Cordova, Alaska, cannery.

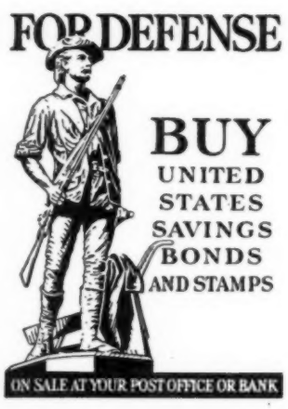
MONAGHAN, 65 ft. Superior Packing Company's cannery tender, Tenakee, Alaska, has been repowered with a Model 909 Buda Diesel with 3-to-1 reduction gears. She also has a new set of Willard storage batteries.

COMPLETELY Atlas Imperial Diesel equipped, the Standard Oil Company's new 70 ft. tug *Despatch No. 8*, by F. L. Fulton Shipyard, Antioch, California, has a 13" x 16", 400 hp. at 300 rpm. main engine, and auxiliary Atlas-Lanova Diesel of 15 hp.

CAVALIER, 56 ft. halibut boat owned by Captain Fritz Bold of Aberdeen, Washington, has been powered with a new 135 hp. Murphy Diesel with Twin Disc reduction gears.

REPETITION of Superior repowering comes to the front again with the installation of a larger Superior Diesel in Western Tug and Barge Company's towboat *Bee*, Seattle, Washington. The new engine is a 6 cylinder, 8½" by 10½", rated 240 hp. at 700 rpm., replacing a 130 hp. Superior.

JUNEAU, Alaska, salmon seiners—*Tennessee,* owned by Jimmy Marks, and Bill Marks, *New Anny,* are now both equipped with new 6 cylinder Caterpillar marine Diesels with 3-to-1 Twin Disc reduction gears.



Vellumoid Gaskets

WITH engine maintenance so important, repair men are relying on VELLUMOID Gaskets for Oil, Gasoline, and Water connections to protect their repair work. VELLUMOID is a tough, fibrous sheet which stands the gaff of

hard service. It is compressible, filling the irregularities of the flanges, and making tight connections which stay tight. No shellac is required, and these gaskets are easy to put on and easy to take off. Gaskets are quickly cut or tapped out of sheet VELLUMOID as needed.

Diesel Engineers Plan Wartime Program for National Meeting in Peoria, June 17-19

A ROUND-TABLE discussion of wartime operating problems and numerous papers on timely subjects will highlight the 15th National Meeting of the ASME Oil and Gas Power Division. The SAE Diesel-Engine Activity will cooperate in this meeting, contributing a symposium and several papers.

According to present plans, the round-table session will start with short practical talks by operators or internal-combustion-engine equipment and manufacturers' engineers—J. B. Harshman, Stanolind Pipeline Co.; C. U. Pollard, Algona, Iowa; E. R. Spencer, Cooper-Bessemer Co.; L. Downing, Rock Island Railroad; Lee Schneitter, Ebasco Services; R. T. Sawyer, American Locomotive Co.; A. B. Willi, Federal-Mogul Corp.; and others. In the open discussion period following, operators and engineers will pool their ideas and experiences. Users of Diesel and gas-engine equipment are invited to bring questions arising out of the special problems of operation and maintenance under war conditions.

The SAE will present a symposium on "Control of Lubricating-Oil Consumption in High-Speed Diesel Engines," with the following speakers: M. M. Roensch, Chrysler Corp.; A. T. Stahl, Mack Mfg. Corp.; M. O. Teetor, Perfect Circle Co.; Stuart Nixon, Sealed Power Co.; W. B. Sawers, American Hammered Piston Ring Div., Koppers Co.; Paul S. Lane, Muskegon Piston Ring Co.; F. G. Shoemaker, Detroit

Diesel Engine Div., General Motors Corporation. Other technical sessions will cover engine design, power-plant design, and combustion. A trip to the Caterpillar Tractor Co.'s proving grounds will display Diesel-powered tractors and earth-moving equipment in action.

More than thirty leading manufacturers will display the latest in engine and accessory equipment in the largest exhibit yet held in connection with this conference. Considerable interest attaches to the Scientific Exhibit, a new feature, which will include displays from universities and research organizations, and a captured Mercedes-Benz aircraft engine. R. W. Young, Chief Engr., Wright Aeronautical Corp., will analyze the engineering details of this unit.

The Peoria committee has arranged a social program that will permit relaxation after the various phases of the extensive technical program. The highlights are a "Gay Nineties" buffet supper and evening, an old-style Illinois fish-fry, and the informal banquet. In addition, there will be a full program for ladies, including a picnic luncheon and a bridge luncheon.

Hotel Rates

Room Rates:

Single room with bath (single occupancy) $2.80, $3.45, $4.10 and $4.60 per day.

Double room with bath (double occupancy) $4.10, $4.80, $5.20 and $5.80 per day.

Double room with twin beds and bath (double occupancy) $5.80, $6.30, $6.90 and $9.20 per day.

Suites—$9.00 or $12.00 per day.

Make reservations early. Address them to Jerry B. Gordon, Managing Director, Hotel Pere Marquette, Peoria, Ill.

Caterpillar Advances E. W. Jackson and D. O. Nash

APPOINTMENT of E. W. Jackson to the position of Assistant to the President and the promotion of D. O. Nash to succeed Mr. Jackson as General Service Manager, was recently announced by L. B. Neumiller, President of Caterpillar Tractor Co., Peoria, Illinois.

E. W. Jackson

Mr. Jackson had been General Service Manager of Caterpillar since January, 1937. A native of Aikin, Maryland, and a graduate of Johns Hopkins University at Baltimore, Mr. Jackson, after finishing college, served as junior engineer for the United States War Department, becoming Proof Director of the Ordnance Department at the Aberdeen Proving Ground. In this capacity he became familiar with Caterpillar products and, in 1929, when the Company's Diesel Engines were in an early experimental stage, took a position in the Caterpillar Research Laboratory at San Leandro, California.

When the laboratory was transferred to Peoria in 1933, Mr. Jackson moved with it and entered the Service Department a few months later. Due to his early association with Diesel Engine research, and the fact that he came to Peoria just as Caterpillar began volume production of its Diesels, Mr. Jackson is nationally known for his knowledge of Diesels.

D. O. Nash

Mr. Nash, new General Service Manager, was born in the San Joaquin Valley, California, and is an alumnus of Oregon State University. After seven years in the Service Department of the Cousins Tractor Company, Caterpillar Distributor in California, he joined Caterpillar Tractor Co. at San Leandro in 1937. Mr. Nash served two years as Field Service Representative, before taking a position as Service and Parts Manager for Peterson Tractor & Equipment Co. at Hayward, California. In November 1940, he joined the Field Service Division of Caterpillar at Peoria. He has also served as Manager of the Service Development Division, and the Service Engineering Division.

Tuthill Pump Company Appointments

THE appointments of J. D. Young as manager of pump sales and W. J. Wagner as assistant to the president have just been announced by G. B. Tuthill, president of the Tuthill Pump Company, Chicago.

Machine Maintenance With Metallizing

SIXTEEN-page Bulletin 42A, just published by Metallizing Engineering Co., Inc., 21-07 41st Ave., Long Island City, N. Y., describes the metallizing process and equipment for its application. It describes briefly how essential industries are eliminating replacements and increasing service-life of equipment now difficult to replace by building up worn diameters with any desired wear and corrosion-resistant sprayed metal. Also indicates how metallizing is used to salvage rapidly mismachined parts and defective castings in production. Examples are given to show how metallized "inserts" and coatings are helping manufacturers conserve vital metals. Write for a copy of Bulletin 42A.

Charles H. Currier Elected

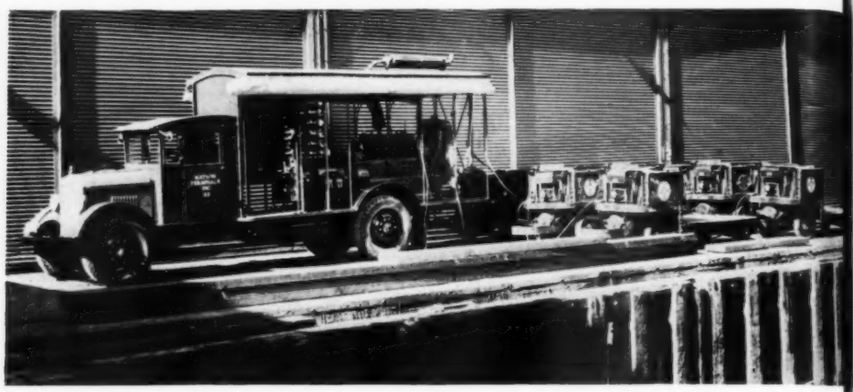
CHARLES H. CURRIER becomes the new President of the Tubular Exchanger Manufacturers' Association as a result of recent elections held in New York City. Mr. Currier is Vice President and General Manager of Ross Heater and Mfg. Co., a division of American Radiator and Standard Sanitary Corp., with general offices and plant in Buffalo, N. Y. Other officers elected with Mr. Currier are W. C. Beekley, Vice President, and W. J. Parker, Secretary-Treasurer, re-elected. The Executive Committee for this year consists of Mr. Currier, Mr. Beekley, G. S. Patton and M. W. Sterling, ex-officio.

In addition to Ross Heater and Mfg. Co., Inc., these firms comprise the membership of the Association: Foster Wheeler, Alco Products,

Charles H. Currier

Henry Vogt Machine Co., Whitlock Mfg. Co., Griscom-Russell, Struthers-Wells, the Lummus Co. and M. W. Kellogg Co. All are manufacturers of heat exchangers. Headquarters of the Association are at 366 Madison Ave., New York City.

Portable Diesel Battery Charger Saves Time and Money



This five ton truck owned by the Matson Terminals, Inc., in San Francisco is used on its docks for charging electric dock jitneys. Mounted on the truck is a 60 hp. Model 63 Fairbanks-Morse Diesel engine, direct connected to a 55 volt, 40 kw. battery charging generator and equipped with switch panel providing for eight charging outlets. Eight of the Matson freight jitneys were being charged at the same time when this picture was taken. This portable set is in constant service at the docks and due to the savings effected by the unit and its flexibility, dock officials are highly pleased with its operation.

Caterpillar Appointments

APPOINTMENT of Gail E. Spain to the position of Vice-President, and the promotion of John Q. McDonald to General Sales Manager, is announced by Caterpillar Tractor Co. Mr. Spain, who has been General Sales Manager since November, 1940, succeeds the late D. G. Sherwin and will move to Caterpillar

San Leandro, California, office to direct activities there and coordinate operations with those in Peoria.

G. E. Spain

Mr. Spain is a native of Portland, Oregon. He was graduated from Oregon State College in 1920 with the degree of Mechanical Engineer. After his graduation, Mr. Spain joined the Willamette Iron & Steel Works at Portland, Oregon, and spent nine years with that organization in the sales and engineering departments. For two years before coming to Caterpillar, Mr. Spain was Willamette's Sales Manager. Mr. Spain joined Caterpillar Tractor Co. at San Leandro in 1929 and was transferred to Peoria the same year. He has held, progressively, the positions of Logging Representative, Assistant Manager Merchandise Department, Assistant Manager Engine Sales Division, Assistant Sales Manager, Manager Sales Development Division and General Sales Manager. He also served one year with Sullivan Machinery Co. as General Manager of the Rock Handling Division.

Mr. McDonald has served as Export Sales Manager since May, 1940. A native of Lompoc, California and a graduate of the University of California, he served throughout World War I commissioned as a pilot in the U. S. Army Aviation Corps. In 1927 he joined Caterpillar as supervisor of agricultural sales for the western United States and the western part of Canada. In 1929 he went to Europe to study the applications of Caterpillar track-type Tractors in Russia. Returning to this country in 1930, Mr. McDonald served for four years as district representative for the company in various parts of the country. In 1934 he became the company's district representative in London and countries in northern Europe, returning two years later to Peoria to serve as Export Sales Supervisor and Assistant Export Sales Manager before his promotion to Export Sales Manager.

J. Q. McDonald

J. D. Fletcher, Vice President, will take over the active direction of export sales in addition to his duties as head of the Export Department.

The Board of Directors of Caterpillar, besides elevating Mr. Spain to a Vice-Presidency, took action to place on the board Mr. C. O. G.

Miller of San Francisco, California, to fill the vacancy left by the recent death of John A. McGregor. Mr. Miller is a director also of the Pacific Gas and Electric Company, Pacific Lighting Corporation, Soundview Pulp and Paper Co., and Coos Bay Lumber Co., and is recognized as one of the outstanding business men of the country.

Edwin J. Schwanhausser Elected Worthington Director

MR. EDWIN J. SCHWANHAUSSER of Buffalo, New York, Vice-President, Worthington Pump and Machinery Corporation, has been elected to the Corporation's Board of Directors, filling a vacancy created by the death of Edward T. Fishwick.

Mr. Schwanhausser has been a vice-president of the Corporation since 1939, and a member of the Worthington organization since his graduation from Stevens Institute of Technology in 1915. For fourteen years he was connected with the Harrison, New Jersey, Works, being appointed Assistant Manager in 1927. In 1929, he was appointed Manager of the Corporation's Buffalo Works, and was advanced to the position of Vice-President in 1939, assuming, in addition to general administrative duties, responsibility for directing the Corporation's sales of Diesel and gas engines. Prominently identified for many years with civic activities, Mr. Schwanhausser served in 1937 and 1938 as President of the Buffalo Chamber of Commerce. He is a trustee of the Buffalo Savings Bank, and a director of Electro-Refractories and Alloys Corporation of Buffalo.

In addition to Mr. Schwanhausser, all retiring directors of the Corporation were reelected at the annual meeting of the stockholders held in Wilmington May 1.

James K. Fulks

AT A MEETING Thursday of the directors of Ex-Cell-O Corporation, James K. Fulks was made an officer of the company being appointed Vice President in Charge of Manufacturing. The announcement was made today by Phil Huber, President and General Manager of Ex-Cell-O. Mr. Fulks joined the company as a young man in 1925, with an unusual background of technical training, and since then has come up through all the practical phases of the company's production of precision machine tools and parts. From November, 1940, he has been in charge of the different Ex-Cell-O factories, now entirely engaged in war work.

Latest Diesel Patents

A description of the outstanding patented inventions on Diesel and Diesel accessories as they are granted by the United States Patent Office. This information will be found a handy reference for inventors, engineers, designers and production men in establishing the dates of record, as well as describing the important Diesel inventions.

Conducted by C. CALVERT HINES*

2,260,341

LUBRICATING OIL COMPOSITION

John E. Schott, New York, N. Y., assignor to Tide Water Associated Oil Company, Bayonne, N. J., a corporation of Delaware. No Drawing. Application April 5, 1938, Serial No. 200,073

3 Claims. (Cl. 252—37)

1. Substantially liquid and non-stringy lubricating oil for internal combustion engines operating at high sustained speeds and under extreme service conditions of temperature and pressure such as may be encountered in Diesel engine lubrication, which comprises a hydrocarbon motor oil of suitable viscosity for the intended service compounded with approximately 1% by weight of aluminum stearate and a quantity of hydroxy butyloxy-ethyl ether, in the range of about 5% to 20% by weight of said aluminum stearate, sufficient to improve the lubricating efficiency of the oil, the ingredients of said compounded oil being subjected to a heat treatment at an elevated temperature and for a period of time sufficient to produce a resulting product which has substantially the viscosity and fluidity characteristics of the uncompounded oil.

* Patent Attorney, 811 E. Street, N.W., Washington, D. C.

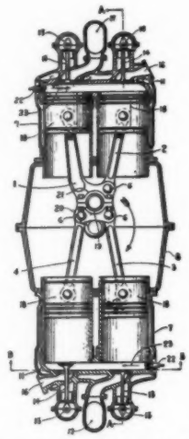
2,212,595

OPPOSED TWIN CYLINDER ENGINE

Clarence E. Fisher, Baltimore, Md.

Application March 9, 1936, Serial No. 67,9

11 Claims. (Cl. 123—53)



1. An engine of the twin cylinder type com prising a crank shaft and plurality of units, eac of said units having four cylinders arranged i pairs, the cylinders of each pair having paralle axes which are coincident with the axes of th cylinders of the other pair, a piston in each cy inder, a master connecting rod connecting on piston of each unit with a pin on said crank shaft, the remaining pistons having connectin rods articulated to said master connecting rod alternate units having their master connectin rods diametrically disposed.

2,206,914

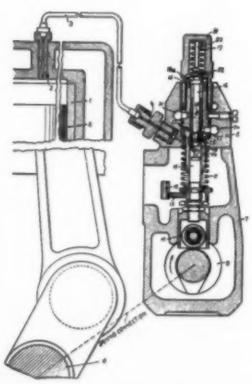
FUEL INJECTION DEVICE

Helmuth Muller and Anton Pischinger, Co logne, Germany, assignors, by mesne assign ments, to Klockner-Humboldt-Deutz, A. G. Cologne-Deutz, Germany, a corporation o Germany

Application February 10, 1938, Serial No. 189,768

In Germany February 18, 1937

10 Claims. (Cl. 103—41)

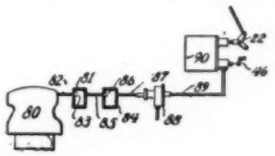


10. In a fuel feeding device for internal com bustion engines, pumping means comprising two telescoping pistons defining between them a pump chamber, a cylinder in which the outer one of said pistons is adapted to reciprocate, means for supplying fuel to said pump cham ber, means for reciprocating the outer one of said pistons, elastic means pressing the inner one of said pistons in the direction to reduce the size of said pump chamber, said outer pis ton having a series of injection ports, said cylin der having an outlet port with which said injec tion ports are adapted to register successively

during the reciprocation of said outer piston, said inner piston being adapted to move under the influence of said elastic means to press fuel out through each registered port in turn and having a cut-off edge for closing said ports successively as it advances.

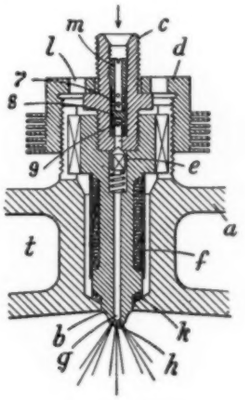
2,262,022
ENGINE PRESSURE REGULATOR
Wilton G. Lundquist, Glen Rock, and Roland Chilton, Ridgewood, N. J., assignors to Wright Aeronautical Corporation, a corporation of New York.
Application March 4, 1939, Serial No. 259,786
4 Claims. (Cl. 123—103)

1. In an internal combustion engine including a throttle in combination, a plurality of serially connected pressure balancing chambers, a piston chamber open to the first chambers to receive a pressure therein proportional to the



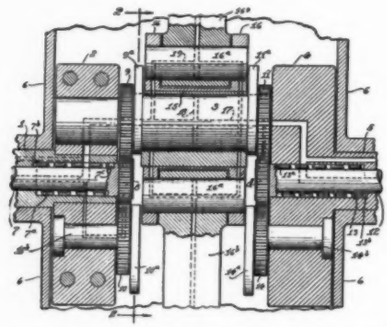
M. E. P. of the engine, a piston in said piston chamber, resilient means to urge said piston into said chamber against said pressure, wherefore pressure variations may move the piston against said resilient means, and means actuated by piston movement for opening and closing said throttle.

2,264,914
INJECTION NOZZLE
Rudolph L'Orange, Stuttgart-Feuerbach, Germany.
Application April 2, 1938, Serial No. 199,621
In Germany July 26, 1937
8 Claims. (Cl. 299—107.1)



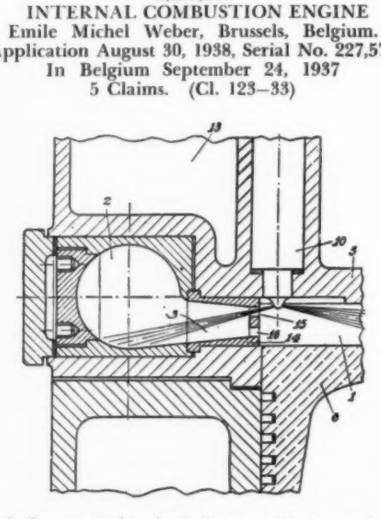
1. A fuel oil injection nozzle for insertion in an opening in the cylinder wall of an internal combustion engine, said nozzle including a body portion having an axially-extending bore through which the fuel passes on its way to the cylinder, a part of said body portion being within the opening in the cylinder wall and spaced from the wall defining said opening to form an air space between said body portion and said wall and a part of said body portion extending outwardly beyond the cylinder wall, and a cap engaging said outwardly-extending portion and a portion secured to said cylinder wall to retain said body portion within said opening, said cap having openings through the top thereof, with air passages located between the air space surrounding that part of the body portion within the opening and the openings in said top to permit circulation of air through said air spaces, passages, and openings to effect cooling of said body portion.

2,209,012
INTERNAL COMBUSTION ENGINE
Jean A. H. Barkeij, Altadena, Calif.
Application October 27, 1933, Serial No. 695,459
Renewed January 23, 1939
19 Claims. (Cl. 123—48)



1. In an internal combustion engine, a pressure lubricating system, mechanism controlled by the application of the lubricating system thereto to regulate the engine compression ratio, and valve means controlled independent of the speed of the engine to control the application of the lubricating system to the mechanism to vary the compression ratio, said mechanism tending normally to increase the compression ratio of said engine with increased engine speeds responsive to increased throttle openings.

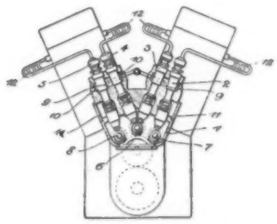
2,262,981
INTERNAL COMBUSTION ENGINE
Emile Michel Weber, Brussels, Belgium.
Application August 30, 1938, Serial No. 227,575
In Belgium September 24, 1937
5 Claims. (Cl. 123—33)



1. In an engine including a cylinder and a piston slidable therein, of the type in which liquid fuel is directly injected, a principal compartment, an auxiliary compartment, a passage connecting said compartments; a single multiple-jet injector arranged with its mouth located in the principal compartment, in the immediate proximity of the passage between the principal and auxiliary compartments, a partition partly closing said passage and arranged in immediate proximity of the principal compartment, an aperture in said partition for the passage of a fuel jet directed from the injector into the auxiliary compartment, at least one aperture in said partition for guiding the air penetrating, during the compressing stroke, into the auxiliary compartment so as to cause whirling turbulence in the latter, and at least one aperture in the partition for deflecting ignited gases, penetrating from the auxiliary into the principal compartment, from the mouth of the injector.

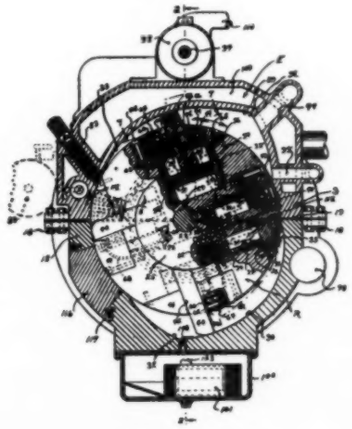
2,231,264
FUEL INJECTION PUMP FOR MULTI-CYLINDER ENGINES
Albert Friedrich and Victor Ulrich, Stuttgart-Cannstatt, Germany, assignors to Daimler-Benz Aktiengesellschaft, Stuttgart-Unterturkheim, Germany
Application December 15, 1938, Serial No. 245,810
In Germany December 27, 1937
8 Claims. (Cl. 123—139)

1. In an internal combustion engine having two rows of more than one cylinder each, positioned in the form of a V relatively to one another, the combination of V-shaped pump structure the legs of which are at substantially the same angle as the rows of cylinders, said pump structure including one or more sets of substantially coplanar pumps, at least two pumps in each leg, conduits leading from said pumps to respective individual cylinders so that each cylinder is supplied by a separate pump, and means for mounting said V-shaped pump struc-



ture on one end of said engine, the legs of said pump structure lying substantially co-incidentally with the legs of said V-engine.

2,263,275
ROTARY INTERNAL-COMBUSTION ENGINE
George F. Pieper, Milwaukee, Wis.
Application February 26, 1941, Serial No. 380,661
8 Claims. (Cl. 123—16)



1. In a rotary Diesel internal combustion engine, a stator having a firing chamber therein and a chamber located in advance of the firing chamber, each of said chambers being provided with a cam face, a rotor snugly fitted in said stator provided with equidistantly spaced cylinders, removable cylinder liners fitted in said cylinders, removable cylinder heads carried by the rotor closing the cylinders and holding the liners in place, pistons reciprocally mounted in the cylinder liners, rigid vanes carried by the pistons slidable through the cylinder heads, means for supplying air from the exterior of the engine to the inner ends of the cylinders at certain times, means for controlling the flow of air

from the cylinders to the combustion chamber, and spring means normally urging the vanes and pistons outwardly, the vanes and pistons being adapted to be cammed inwardly by the cam faces of the stator chambers.

5. In a rotary Diesel internal combustion engine, a stator having a firing chamber therein, and a chamber located in advance of the firing chamber, each of said chambers being provided with a cam face, a rotor snugly fitted in said stator, sliding vanes carried by the rotor movable into the chambers and adapted to be cammed into the rotor by the cam faces, spring means normally urging the vanes outward into the chambers, means operated by the vanes for compressing air in the rotor, means for controlling the flow of compressed air into the firing chamber, a fuel injector carried by the stator communicated with the firing chamber, a fuel pump operated from the rotor for supplying fuel under pressure to the injector, means for supplying fuel to the pump, a by-pass passage in the stator for the pump, and a governor driven from said rotor for controlling the by-pass passage.

2,261,856

FUEL PUMP CONTROL BY VARIABLE TRANSMISSION

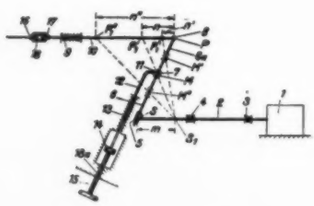
Franz Neugebauer and August Lichte, Dessau-Alten, Germany, assignors to Junkers Flugzeug-und-Motorenwerke Aktiengessellschaft, Dessau, Germany.

Application December 23, 1937, Serial No. 181,292

In Germany December 28, 1936

4 Claims. (Cl. 123—140)

1. In a control mechanism for an engine, a governor, fuel dispensing means, and means for connecting said governor to said dispensing means; said connecting means comprising a lever, means joining said lever adjacent one end to said governor means, means joining said



lever adjacent an opposite end to said fuel dispensing means, a fulcrum for said lever, and means mounting said fulcrum on said lever between the two joining means for movement to positions along said lever with the locus of said positions constituting the axis of said lever at a predetermined position within its range of angular movement.

DIESEL PROGRESS

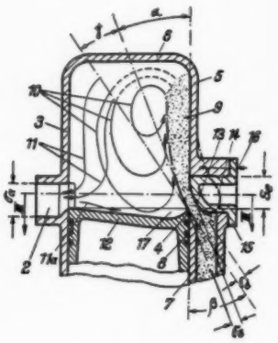
Aircraft & Diesel Equipment Corp.	13
Air-Maze Corporation	7
Aluminum Company of America	2
American Air Filter Co.	22
American Bearing Corp.	27
American Blower, Hydraulic Coupling Div.	71
American Bosch Corp.	78
American Locomotive Co.	80
Atlas Imperial Diesel Engine Co.	20
Blackmer Pump Co.	75
Briggs Clarifier Company	19
Brodie System, Inc.	76
Buckeye Machine Co.	79
Buda Company	1
Burke Electric Co.	80
Busch-Sulzer Bros.-Diesel Engine Co.	18
Cities Service Oil Co.	31
Columbia Electric Mfg. Co.	72
Cooper-Bessemer Corp.	Fourth Cover
Cummins Engine Company	23
Detroit Gasket & Mfg. Co.	76
Diamond Chain & Mfg. Co.	63
Diesel Engineering & Mfg. Corp.	77
Double Seal Ring Co.	3
Electric Auto-Lite Co.	59
Elliott Company	Third Cover
Enterprise Engine & Foundry Co.	6
Erie Forge Company	21
Ex-Cell-O Corporation	79
Fairbanks, Morse & Co.	25
Federal-Mogul Corporation	34
Fitzgerald Manufacturing Co.	78
General Machinery Corp.	28
General Motors Corp., Cleveland Diesel Engine Division	40-41
Gray Marine Motor Co.	79
Gulf Oil Corporation	24
Hall Manufacturing Co.	72
Holcomb Engineering Co.	79
Honan-Crane Corp.	77
Illinois Testing Laboratories, Inc.	62
Koppers Co., American Hammered Piston Ring Div.	14
Korfund Company	15
Liquidometer Corp.	79
Lovejoy Flexible Coupling Co.	78
Luber-Finer, Inc.	69
Mack Manufacturing Corp.	70
Manzel Bros. Co.	78
Maxim Silencer Co., The	68
McCord Radiator & Mfg. Co.	79
National Supply Co., The	12
Naylor Pipe Company	76
Nordberg Mfg. Co.	4-5
Norma-Hoffmann Bearings Corp.	79
Wm. W. Nugent & Co.	73
Penn Electric Switch Co.	66
H. O. Penn Machinery Co., Inc.	80
Petrometer Corporation	78
Pickering Governor Co.	79
Pierce Governor Co.	10
Pittsburgh Equitable Meter Co.	80
Quincy Compressor Co.	74
Roots-Connersville Blower Corp.	80
Geo. D. Roper Corp.	76
Ross Heater & Mfg. Co., Inc.	67
Saginaw Malleable Iron Div.	29
Sinclair Refining Co.	61
Socony-Vacuum Oil Co.	8-9
Standard Oil Co. of California	16-17
Star Electric Motor Co.	78
Staynew Filter Corp.	32
Texas Company, The	Second Cover
Thompson Products, Inc.	78
Tuthill Pump Company	76
Twin Disc Clutch Co.	74
U. S. Motors Corp.	73
Viking Instruments, Inc.	79
Waukesha Motor Company	11
Westinghouse Electric & Mfg. Co.	33
Weston Electrical Instrument Corp.	64
W.G.B. Oil Clarifier, Inc.	75
Witte Engine Works	76
Woodward Governor Co.	80
Young Radiator Co.	65
Youngstown Miller Co., Inc.	79

2,190,011

SCAVENGING OF HIGH SPEED TWO-STROKE INTERNAL COMBUSTION ENGINES

Walter Boxan, Chemnitz, Germany, assignor to Auto Union Aktiengesellschaft, Chemnitz, Germany

Application October 19, 1937, Serial No. 169,893
In Germany October 26, 1936
4 Claims. (Cl. 123—65)



2. In a two-stroke internal combustion engine the combination of a cylinder, an exhaust port, an inlet nozzle and a piston controlling fluid passage through the port and nozzle, said nozzle being adapted to direct a charge into the cylinder at such pressure and velocity as to cause said charge to enter the cylinder as a free jet and thereby exert a suction effect upon the part of the charge released by the dispersion of the jet to produce an eddy tending to hold the charge in the cylinder, with said piston being hollowed in the portion thereof facing said nozzle.

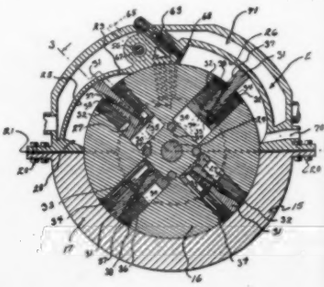
2,263,274

ROTARY DIESEL INTERNAL-COMBUSTION ENGINE

George F. Pieper, Milwaukee, Wis.

Application June 6, 1940, Serial No. 339,089
2 Claims. (Cl. 123—16)

1. A rotary Diesel internal combustion engine comprising a stator having a firing chamber therein and a chamber located in advance of the firing chamber, each of said chambers being provided with a cam face, a rotor in said stator, sliding vanes carried by the rotor movable into the chamber and adapted to be cammed into the rotor by the cam faces, spring means normally urging the vanes outward into the chambers, means operated by the vanes for



compressing air in the rotor, the stator having an air inlet port, air-conducting passageways for the chambers momentarily registering with the port during movement of the rotor, slide valves carried by the rotor for controlling the opening and closing of the passageways, a stationary cam track formed on the stator, stems on the slide valves extending toward the track, and anti-friction rollers on the stems engaging the track for bringing about the opening and closing of the slide valves.